Morphological and Ecological Characteristics of Canadian Freshwater Fishes

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ABSTRACT

This document has been prepared as part of an on-going program to provide reference databases describing Canadian freshwater fish species ecology and life history characteristics as a basis for developing standard evaluation techniques that permit comparison of pre- versus post-alteration of habitat and fish productivity conditions. The need for such standard techniques arises from the required assessment of development applications under the Department of Fisheries and Oceans' Policy for the Management of Fish Habitat, of which the guiding principle is "no net loss of the productive capacity of fish habitats". This report extends coverage to species across Canada from that compiled for selected species in the Great Lakes basin earlier.

A compilation of life history parameters is presented for the 207 species of fish that normally maintain viable populations, reproduce, or occur for significant periods of their life, in the freshwaters of Canada. The parameters include: lake or stream habitat preference; thermal preference; dominant adult feeding habits including location, method, and diet; maximum age; maximum length; maximum weight; median age, length, and weight at maturity; reproductive guild; weight-length regressions; and, status as a fishery target. The available information was screened to select data that was, whenever possible, derived from Canadian populations.

The data assembled show the tremendous variety of ecological and life history characteristics to be found in Canadian freshwater fishes, native and introduced.

RÉSUMÉ

Le présent document a été préparé dans le cadre d'un programme continu visant à créer des bases de données de référence qui décrivent les caractéristiques du cycle vital et de l'écologie des espèces de poissons d'eau douce. Ces bases de données serviront à élaborer des techniques standard d'évaluation permettant de comparer l'état de l'habitat et de la productivité des poissons avant et après leur altération. Ces techniques standard sont nécessaires pour évaluer les demandes des promoteurs dans le cadre de la Politique de gestion de l'habitat du poisson du ministère des Pêches et des Océans, dont le principe directeur est de n'autoriser aucune perte nette de la capacité de production des habitats du poisson. Le présent rapport touche non seulement les espèces du bassin des Grands Lacs déjà retenues, mais des espèces présentes dans l'ensemble du Canada.

Une compilation des paramètres du cycle vital est présentée pour les 207 espèces de poissons qui maintiennent habituellement des populations viables, se reproduisent ou vivent pendant une portion importante de leur existence dans les eaux douces canadiennes. Les paramètres sont les suivants : préférence pour des habitats lacustres ou lotiques; préférences thermiques; habitudes alimentaires prédominantes chez les adultes (endroit, méthode et régime); âge maximal; longueur maximale; poids maximal; âge, longueur et poids médians à maturité; guilde reproductive; régressions poids/longueur; espèces exploitables par la pêche. On a dépouillé les renseignements existants pour retenir, autant que possible, les données obtenues sur des populations canadiennes.

Les données regroupées montrent l'immense variété des caractéristiques de l'écologie et du cycle vital que l'on peut observer chez les poissons d'eau douce du Canada, qu'ils soient indigènes ou introduits.

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INTRODUCTION

"No net loss of the productive capacity of fish habitats" is the guiding principle of the Department of Fisheries and Oceans' Policy for the Management of Fish Habitat (DFO 1986). The goals of this management policy are: 1) Conservation of healthy habitats; 2) Restoration of damaged habitats; and 3) Development of new habitat resulting in a net gain of productive capacity (Minns 1995, Minns *et al.* 1995, Portt *et al.* 1999). In accordance with this policy and Section 35 of the Fisheries Act, any proposed activity which may alter fish habitat is evaluated for its level of "harmful alteration, disruption or destruction" (HADD). If it is determined that a HADD will occur, then the project is further evaluated to determine if "no net loss (NNL) of the productive capacity" can be achieved through mitigation and compensation actions. Such evaluations can be difficult, due to the lack of evaluation techniques that permit comparison of pre- versus post-alteration habitat and fish productivity conditions. To ensure that the best available science is made available to those regulating impacts of development on fish habitats, all knowledge of the species potentially affected and evaluation techniques based on scientific methods must be presented.

In response to this need for evaluation techniques, Minns *et al.* (1995) developed a defensible quantitative assessment process, Habitat Suitability Matrix (HSM), for Great Lakes nearshore/littoral habitats. HSM is based on measurements of the types and quantities of habitats and their inferred relationship to the productivity of fish populations and communities. The process involves the integration of two numerical valuation systems. The first system delimits the area affected by a proposed project and provides pre- and post-development characterizations of fish habitat with respect to depth, substrate, structure, vegetation, wave energy and height, etc. The second system consists of a series of modules which relate habitat characteristics to fish species by life stage or production processes (Lane *et al.* 1996 a,b,c). When the quantification is complete, through a linkage of the two systems (see Minns *et al.* 1995, Minns and Nairn 1999) site-specific, surrogate measures of habitat productivity (suitabilities) are produced and net change is assessed.

The Great Lakes Laboratory for Fisheries and Aquatic Sciences is continuing to expand the number of species and geographical range of "HSM to Assess Fish Habitat", with the goal of developing, testing and implementing an Internet-based habitat assessment tool for all of Canada. Application databases have been developed for lacustrine habitats in the Great Lakes basin (Lane *et al.* 1996 a,b,c) and Newfoundland-Labrador (Bradbury *et al.* 1999) and for riverine habitats in Ontario (Portt *et al.* 1999). Similar databases are under development for the British Columbia and Yukon, Northwest Territories and Nunavut, and Prairie regions of Canada (Minns unpublished information).

As part of the definition phase of an HSM-based assessment of impact from a proposed development activity, the species listed for any particular area can be grouped using a variety of ecological life history criteria , e.g. trophic level, size at maturity, spawning guild, or fishery type. Databases containing selected life history parameters have already been compiled for selected Great Lakes fishes (Portt *et al.* 1988, Minns *et al.* 1993). The purposes of this document are a) to provide fish habitat management practitioners across Canada with a compact source of basic species ecology and life history, b) to extend the number of criteria available for grouping species and c) to extend the coverage to all fish species occurring in Canadian freshwaters.

METHODS

The fish species considered in this report (Appendix A) occur in the freshwaters of Canada, based upon a compilation by Dr. Nicholas Mandrak (Unpublished contract report to Dr. Minns at Fisheries and Oceans Canada). No attempt was made to collect information on species considered extinct or extirpated from Canada, or on any hybrid forms or tropical species introduced to hot springs. The scientific names of species are also provided in Appendix A.

Information was obtained from secondary literature sources whenever possible. The main texts used were: Freshwater Fishes of Canada (Scott and Crossman, 1973); Encyclopedia of Canadian Fishes (Coad *et al.*, 1995); The Fishes of Ohio (Trautman, 1981); Fishes of Wisconsin (Becker, 1983); Freshwater Fishes of Virginia (Jenkins and Burkhead, 1993); The Inland Fishes of New York State (Smith, 1985); The Fishes of Tennessee (Etnier and Starnes, 1993); Handbook of Freshwater Fishery Biology (Carlander, 1969); Freshwater Fishes of Northwestern Canada and Alaska (McPhail and Lindsey, 1970); Inland Fishes of Washington (Wydoski and Whitney, 1979); Morphological and ecological characteristics of 25 fishes occurring in Great Lakes' Areas of Concern (Minns *et al.*, 1993); Morphological and ecological characteristics of common fishes in Ontario lakes (Portt *et al.*, 1988); and, Temperature Relationships of Great Lakes fishes: a data compilation (Wismer and Christie, 1987). This was supplemented with additional information obtained from other primary and secondary literature sources identified in the reference lists of the main texts or through a search of the Aquatic Sciences and Fisheries Abstracts (1978-February 2000).

The following life history information was collected for each species. The criteria and assumptions used for the selection of information values are also provided.

- Lake, stream, or lake-stream preference/occurrence.

Preference (p) is assigned to the primary or usual water body of residence, while occurrence (o) is assigned to the water body where a species is known to occasionally occur. Fish that spawn in water bodies that they do not generally or usually reside in (e.g. Pacific salmons), were assigned an "o" for that water body.

- Thermal preference was assigned as "warm" if the preferred temperature was > 25°C, "cool" if it was 19-25°C, and "cold" if it was less than 19°C.

Thermal preference was assigned in accordance with the preferred summer water temperature of a fish species. Preferred temperatures determined for adult fish in laboratory experiments were used when available. If these were not available, evidence used by some authors to indicate temperature preference, such as capture location temperature when a variety of habitat temperatures were available, was used. If presented as a range of individual values or a range of means, the midpoint was taken as the preferred temperature. Whenever possible, the temperature preference was assigned based on data for Canadian populations. If these were not available, data from areas of the United States with climate similar to Canada were used preferentially, but in some cases the only information available were from areas of the southern United States, where the climate is warmer. If a preferred temperature value could not be found for a species, then a combination or subset of typical species habitat, species distribution, upper lethal temperature, upper avoidance temperature, species associations, or temperature information for closely related species was used to assign a thermal preference class. The information considered in the assignment of thermal preference class was noted in the "Comments" field, unless the process was very straight forward, involving a known preferred temperature. In one instance, the thermal preference class does not include the stated preferred temperature (longnose gar) because the preferred temperature was considered to be at odds with the habitat evidence and the thermal preference of related species.

- Trophic feeding preference defined as the dominant feeding pattern as exhibited primarily as an adult.

The scheme used in Minns *et al.* (1993) was utilized in this report, changed only with the addition of a "non-feeding" Location and a "parasitic" Diet type, resulting in:

Location	Method	Diet
bottom	filter	phytoplankton
pelagic	graze	macrophytes (also filamentous algae)
surface	sort	Crustaceans
non-feeding	stalk	Annelids
	pursuit	Molluscs
	ambush	insects
		fish
		parasitic
		other

A preference level of high (1), medium (2), and low (3) was assigned to each of these categories. Scott and Crossman (1973) was the primary source of feeding and diet information, however, other sources were used for species not covered in Scott and Crossman (1973), or to supplement the information in Scott and Crossman (1973) when it was evident that more detailed or recent information was available.

- Selected life history metrics including maximum age, maximum length, maximum weight, median age at maturity, median length at maturity, and median weight at maturity.

For both maximum and at-maturity values in Tables 4 and 5, ages provided should be interpreted as the exact age or age + (i.e. Age 4 = 4 or 4+). In most cases this will be age +. If no Canadian values are available, then preference is given to values from areas with the closest possible match with respect to typical Canadian climatic and habitat conditions.

Where maturity data existed for both sexes, female data are presented. If at-maturity values were provided as a range of individual values or a range of means, the midpoint is provided in this compilation. For lampreys, unless otherwise stated, median age at maturity and length at maturity is taken from the range of these values for transformation from ammocoetes to the adult phase.

- Reproductive guild.

Balon (1975, 1981) were used for determination of the reproductive guilds. Definitions for the XX different reproductive guilds attributed to Canadian freshwater fishes are provided in Appendix B. Twelve species included in this report were not covered in Balon's compilations. Reproductive guilds could not be assigned to the weed shiner and the ghost shiner, as their reproductive behaviour is poorly known. The remaining ten species were assigned to guilds as follows:

Umatilla dace were assumed to belong to the same guild as all other *Rhinichthys* spp., based upon the belief that it was originally derived from hybrids of speckled and leopard dace (Cannings and Ptolemy 1998).

The deepwater sculpin was assumed to be in the same reproductive guild as the fourhorn sculpin. These two species were once considered to be the freshwater and marine forms of the same species.

The pond smelt apparently spawns over organic debris in shallow areas, and the eggs are adhesive and attach to roots and other objects (Scott and Crossman, 1973; Coad *et al.* 1995). This species was assigned to guild A.1.4 based upon this description.

Pygmy smelt spawn over sand and gravel beaches (Coad *et al.* 1995). Based upon this and that they are thought to be closely related to rainbow smelt, pygmy smelt was assigned to guild A.1.3.

Surf smelt spawn on quiet sandy beaches, and the eggs are adhesive (Coad *et al.* 1995). This species was assigned to guild A.1.3 based upon this description.

The reproductive guild of golden trout is assumed to be the same as the rainbow trout, as their relationship has at times been uncertain (Scott and Crossman, 1973), with the golden trout being classified as a subspecies of rainbow trout (Coad *et al.* 1995) with which it has also been known to hybridize (Page and Burr, 1991).

Bull trout were assigned to reproductive guild A.2.3. The spawning description provided in Coad *et al.* (1995) is essentially the same as all other salmons and trouts that are assigned to guild A.2.3.

The warmouth was assigned to B.2.5, the same guild as largemouth bass and the black crappie, based upon the descriptions of spawning habitat and substrate in Carlander (1969) and Jenkins and Burkhead (1993).

The central stoneroller was assigned to guild A.2.3, based upon the description of nesting behaviour in Coad *et al.* (1995), which is similar to other cyprinid species (e.g. creek chub) already assigned to this reproductive guild.

The blackstripe topminnow was assigned to the guild A.1.5, based upon its spawning behaviour which is similar to banded killifish, and comparisons among the accounts of all three killifishes in Coad *et al.* (1995) and the descriptions in Balon (1975).

- Weight-length regressions

Where several weight-length relationships were provided, the largest range of sizes and number of fish was generally preferred. Location (Canada or nearby) occasionally influenced the equation choice. However, a far-field length-weight equation for a large number of fish and a large range of lengths with a high R-value, etc., was preferred over an equation for a Canadian population with few fish or low R-value.

- Species status as a fishery target.

Standard phrases were used in the Status of fishery column, and refer only to that species' utilization in Canada. In most cases Scott and Crossman (1973) was used to obtain utilization information, however, Coad *et al.* (1995) was also used to provide more recent information, and other texts were used occasionally if inferences to the Canadian situation could be made. The standard phrases are as follows.

Bait	Often or widely used as bait.
Occasional bait	Rarely used as bait, or only locally utilized
Subsistence	Used only for own consumption or animal (usually dogs) consumption, and often captured in most efficient way.
Recreational	Commonly captured for recreational purposes (sportfish, panfish) and by any age group of angler.
Occasional recreational	Rarely captured for recreational purposes. Not usually the primary motivation for angling, but might be kept if caught.
Aboriginal	Native fishery.
Historical Aboriginal	Historical native fishery, but no longer occurring.
Commercial	An important commercially captured species.
Incidental commercial	Captured commercially, but is a minor part of the catch of a fishery that is targeting other species. Could also be a small local fishery targeting a generally unexploited species.
Historical commercial	Historical commercial fishery, but no longer occurring.
None	Not utilized.
Unknown	Not known if species is utilized.
?	Could not find any information on this species.

RESULTS

The collected information for each fish species is presented in a series of tables (Tables 1-6) that follow the reference section of this document. Associated information was grouped wherever space allowed. Generally, information for large or commercially important species was readily available, and information for small, obscure, and commercially unimportant species was unavailable or difficult to obtain. A couple of classes of information, associated with weight, were rarely available for any species. Maximum weight could only be found for the most prominent species, and weight at the onset of maturity was unavailable for most.

The ecological and life history features compiled in Tables 1 to 6 for the 207 fish species listed show the range of variation present in Canada's freshwater fish fauna (Tables 7,8). Most species (122) show a preference for both lake and stream ecosystems (Tables 1,7). There are 9 species found only in lakes and 15 lake species that occasionally occur in streams. Most of the remaining species prefer streams or rivers, being either absent from or occurring only occasionally in lakes. There are a few marine and brackish water species that occur occasionally in streams.

While many fishes are exploited in one or other of the many fisheries, there are 75 species with no recorded fishery activity (Tables 1, 7). The next most frequent groups of fish species are those exploited in bait, commercial and/or recreational fisheries. There is broad overlap in the species exploited by commercial or recreational fisheries. The bait fishes mainly represent a separate grouping. There are a number of species only exploited in Aboriginal or subsistence fisheries.

Species are fairly evenly divided among the main thermal groups (cold=68, cool=53 and warm=47) with lesser numbers (12 and 27) straddling the boundaries between them (Tables 2,7). The coldwater group is the largest single group. By temperature preference, the 21-30 and 11-20 C groups account for most of the species where data is available (104 of 207).

The feeding habitats of the species vary considerably and many species deploy more than one location and method (Tables 3, 7). Bottom is the most frequent feeding location followed by pelagic and then surface. Grazing/picking and pursuit are the most frequent feeding methods found among Canadian freshwater fishes. Fish diets are also varied with crustaceans and insects being the most frequent items, although fish, molluscs, and macrophytes (with associated epiflora/fauna) occur quite frequently.

The key life history metrics of fish, size and age, at maximum and maturity, show considerable variation (Tables 4,5,7). Weight data is much less available than length data for these metrics though available length-weight regressions (Table 6,7) might be used to estimate many more. The maximum size of Canadian freshwater fishes ranges from 46 to 6000 mm and from 2.5 to 630000 g with median values of 297 and 2700. Size at maturity shows comparable ranges. The median maximum and maturity ages are 8 and 3 years with ranges of 1 to 154 and 1 to 27 respectively.

Spawning guild information was available for 205 of the 207 fishes (Tables 4,8). A majority of Canadian fishes (121 of 205) are nonguarding open substrate spawners. There are 37 non-guarding brood-hiding lithophils. Most of the guarders (45 of 47) are nest spawners, particularly speleophils (21) and lithophils (14).

These ecological and life history characteristics provide a variety of ways in which freshwater fish assemblages might be grouped for analysis and assessment when examining the potential effects of development activities on the habitats sustaining their productivity and fisheries.

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Table 1. General habitat and status of fishery for Canadian freshwater fishes.

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
LAMPREYS						
chestnut lamprey		p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
northern brook lamprey		p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
silver lamprey	p	o	Scott and Crossman, 1973	Commercial	Lake Erie fishery	Scott and Crossman, 1973
American brook lamprey		p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
river lamprey		p	Scott and Crossman, 1973	Unknown		Scott and Crossman, 1973
Arctic lamprey	p	p	Scott and Crossman, 1973	Aboriginal	Dog food	Scott and Crossman, 1973
Vancouver Island lamprey	p	o	Cannings and Ptolemy, 1998; Beamish, 1982	?		
western brook lamprey		p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
Pacific lamprey	o	p	Scott and Crossman, 1973	Aboriginal; Occasional bait	Native consumption; trout bait	Scott and Crossman, 1973
darktail lamprey	p	p	Houston, 1991	None		
sea lamprey	p	p	Scott and Crossman, 1973	None	Delicacy in Europe	Scott and Crossman, 1973
STURGEONS						
shortnose sturgeon	o	p	Dadswell, 1984	Historical commercial; Incidental commercial		Scott and Crossman, 1973
lake sturgeon	p	p	Scott and Crossman, 1973	Recreational; Historical commercial	Important historical fishery, but now is occasionally angled for.	Scott and Crossman, 1973
green sturgeon		o	Scott and Crossman, 1973	None	Incidental catch only. Not utilized for consumption.	Scott and Crossman, 1973
Atlantic sturgeon		o	Scott and Crossman, 1973	Incidental commercial	Low intensity fishery	Scott and Crossman, 1973
white sturgeon	p	p	Ford *et al.*, 1995	Historical commercial	A short but intense fishery existed in the late 1800s, but soon collapsed due to overfishing.	Hart, 1973
GARS						
longnose gar	p	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	Occasional recreational	No commercial fishery. Are sometimes sought by anglers, apparently for sport only.	Inferred from Scott and Crossman, 1973
spotted gar	p	p	Trautman, 1981; Parker and McKee, 1984a	None		Scott and Crossman, 1973
BOWFINS						
bowfin	p	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	None		Scott and Crossman, 1973
MOONEYES						

[illegible]	Habitat (p=preferred; o=other)			[illegible]	[illegible]	[illegible]
COMMON NAME	Lake	[illegible]	Reference	Status of [illegible]	Comments [illegible]	Reference
goldeye	p	p	Scott and Crossman, 1973	Commercial; Recreational	Commercial fishery and sport fishery in some locations	Scott and Crossman, 1973
mooneye	p	p	Scott and Crossman, 1973; Trautman, 1981	None		Scott and Crossman, 1973
EELS						
American eel	p	p	Jenkins and Burkhead, 1993	Commercial	Commercial fishery for export to Europe	Scott and Crossman, 1973
HERRINGS						
blueback herring	o	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	Commercial		Scott and Crossman, 1973
alewife	p	p	Scott and Crossman, 1973	Commercial		Scott and Crossman, 1973
American shad	o	p	Scott and Crossman, 1973	Commercial		Scott and Crossman, 1973
gizzard shad	p	p	Jenkins and Burkhead, 1993; Trautman, 1981	None		Scott and Crossman, 1973
CARPS and MINNOWS						
chiselmouth	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
central stoneroller		p	Trautman, 1981; McKee and Parker, 1982	None	No known fishery in Canada, but potential use as baitfish. Apparently is a good baitfish in the US, and in parts of its range, where it grows to a large size, it is a prized food fish and is preferred over trout by some fishers.	Becker, 1983
goldfish	p	p	Scott and Crossman, 1973	Incidental commercial	Some caught and marketed with carp	Scott and Crossman, 1973
redside dace		p	Scott and Crossman, 1973; Trautman, 1981	None		Scott and Crossman, 1973
lake chub	p	p	Scott and Crossman, 1973	Occasional bait		Scott and Crossman, 1973
spotfin shiner	o	p	Scott and Crossman, 1973; Trautman, 1981	None	None at present, but has potential for bait	Scott and Crossman, 1973
common carp	p	p	Jenkins and Burkhead, 1993	Occasional recreational; Incidental commercial		Scott and Crossman, 1973; Jenkins and Burkhead, 1993
gravel chub		p	Smith, 1979; Trautman, 1981; Scott and Crossman, 1973	None		Scott and Crossman, 1973
cutlips minnow		p	Scott and Crossman, 1973	Occasional bait		Scott and Crossman, 1973
western silvery minnow	p	p	Nelson and Paetz, 1992; Fishbase; Inferred from Trautman, 1981 and Scott and Crossman, 1973	Bait	Assumed same as eastern silvery minnow	Scott and Crossman, 1973
brassy minnow	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
eastern silvery minnow	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
striped shiner	o	p	Jenkins and Burkhead, 1993	Bait	Inferred from common shiner species account	Scott and Crossman, 1973
common shiner	o	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
redfin shiner		p	Becker, 1983; Etnier and Starnes, 1993	None	Used as bait in some areas of the US	Scott and Crossman, 1973
silver chub	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
pearl dace	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
peamouth	p	p	Scott and Crossman, 1973	Historical commercial; Recreational	Historically used as food in hotels, and angled for.	Scott and Crossman, 1973
hornyhead chub		p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
river chub		p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
golden shiner	p	o	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
pugnose shiner	p	p	Trautman, 1981; Phillips *et al.*, 1982; Parker *et al.* 1987c	None		Scott and Crossman, 1973
emerald shiner	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
bridle shiner	p	p	Scott and Crossman, 1973	Occasional bait		Scott and Crossman, 1973
river shiner	o	p	Smith, 1979; Phillips *et al.*, 1982	None		Scott and Crossman, 1973
ghost shiner		p	Smith, 1979; Holm and Coker, 1981; Holm and Houston, 1993	None	None likely based on its limited distribution in Canada, small size, and habitat that is difficult to collect in using traditional baitfish harvest methods.	
bigmouth shiner	o	p	Smith, 1979; Tompkins, 1987	Bait		Becker, 1983
blackchin shiner	p	p	Scott and Crossman, 1973	Occasional bait		Scott and Crossman, 1973
blacknose shiner	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
spottail shiner	p	p	Scott and Crossman, 1973; Smitt, 1979	Bait		Scott and Crossman, 1973
silver shiner		p	Jenkins and Burkhead, 1993; Trautman, 1981	Occasional bait		Baldwin, 1988
rosyface shiner	o	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	None		Scott and Crossman, 1973
sand shiner	p	p	Jenkins and Burkhead, 1993; Trautman, 1981	None		Scott and Crossman, 1973
weed shiner	p	p	Becker, 1983; Smith, 1979; Phillips *et al.*, 1982	None		Becker, 1983
mimic shiner	p	p	Jenkins and Burkhead, 1993; Trautman, 1981	None	Potential bait species, but utilization unknown	Scott and Crossman, 1973
pugnose minnow	p	p	Scott and Crossman, 1973; Smith, 1979; Trautman, 1981	None		Scott and Crossman, 1973

[illegible]	Habitat (p=preferred; o=occasional)			[illegible]	[illegible]	[illegible]
COMMON NAME	Lake	Stream	Reference	Status of [illegible]	Comments	Reference
northern redbelly dace	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
finescale dace	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
bluntnose minnow	p	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	Occasional bait		Scott and Crossman, 1973
fathead minnow	p	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	Bait		Scott and Crossman, 1973
flathead chub	o	p	Scott and Crossman, 1973; Nelson and Paetz, 1992	Bait; Occasional recreational		Scott and Crossman, 1973
northern squawfish	p	o	Scott and Crossman, 1973; Wydoski and Whitney, 1979	Occasional recreational		Scott and Crossman, 1973
blacknose dace		p	Scott and Crossman, 1973; Trautman, 1981	Bait		Scott and Crossman, 1973
longnose dace	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
leopard dace	o	p	Wydoski and Whitney, 1979; Carl *et al.*, 1959	Unknown		Scott and Crossman, 1973
speckled dace	o	p	Wydoski and Whitney, 1979	Bait		Scott and Crossman, 1973
Umatilla dace	o	p	Cannings and Ptolemy, 1998	?		
redside shiner	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
rudd	p	p	Smith, 1985	Bait	Cultured as a baitfish in the Great Lakes region	Coad *et al.*, 1995
creek chub	p	p	Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
fallfish	o	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	Occasional recreational	Some angling as a sport fish, but not known as a baitfish.	Scott and Crossman, 1973; Jenkins and Burkhead, 1993
tench	p	p	Scott and Crossman, 1973; Wydoski and Whitney, 1979	None		Scott and Crossman, 1973
SUCKERS						
quillback	p	p	Scott and Crossman, 1973	Incidental commercial	A commercial species and a sportfish in the US, but in Canada there is apparently no angling, and is included in the commercial catch of suckers or other coarse fish.	Scott and Crossman, 1973
longnose sucker	p	p	Scott and Crossman, 1973	Aboriginal; Incidental commercial		Scott and Crossman, 1973
bridgelip sucker	o	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
white sucker	p	p	Scott and Crossman, 1973	Bait; Incidental commercial; Occasional recreational; Subsistence	Important bait species when small. Not generally angled for in Canada, and some minor commercial catch, often caught incidentally.	Scott and Crossman, 1973
largescale sucker	p	p	Scott and Crossman, 1973; Wydoski and Whitney, 1979	Historical Aboriginal	Likely historical native utilization, but none known today	Scott and Crossman, 1973
mountain sucker	o	p	Scott and Crossman, 1973; Wydoski and Whitney, 1979; Hauser, 1969	None		Scott and Crossman, 1973

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
lake chubsucker	p	p	Becker, 1983	None		Scott and Crossman, 1973; Becker, 1983
northern hog sucker	o	p				
bigmouth buffalo	p	p	Goodchild, 1990c; Scott and Crossman, 1973	Incidental commercial	Some commercial catch in Saskatchewan, however, is a highly regarded sport fish in the US Mississippi River area.	Scott and Crossman, 1973; Becker, 1983
black buffalo	p	p	Becker, 1983	None		Houston, 1990d
spotted sucker	p	p	Parker and McKee, 1984b; Trautman, 1981; Becker, 1983	None		Scott and Crossman, 1973
silver redhorse	o	p	Jenkins and Burkhead, 1993; Scott and Crossman, 1973	Incidental commercial	Not significant as a sport or commercial fish in Canada, but make up a portion of the commercial catch in the St. Lawrence River and in some US locations.	Scott and Crossman, 1973; Becker, 1983
river redhorse	o	p	Parker and McKee, 1984c	Commercial	Component of some local commercial fisheries	Scott and Crossman, 1973
black redhorse		p	Scott and Crossman, 1973; Trautman 1981; Parker, 1989b; Beak Consultants Limited, 1980	None	Not significant as a sport or commercial fish in Canada, but make up a portion of the commercial catch in some US locations.	Scott and Crossman, 1973; Becker, 1983
golden redhorse	o	p	Goodchild, 1990d	None	None in Canada, but considered to have a superior flavour in the US and is angled and speared.	Scott and Crossman, 1973
copper redhorse	p	p	Coad *et al.*, 1995	None	Too rare to be of any commercial or sportfish value	Scott and Crossman, 1973
shorthead redhorse	p	p	Jenkins and Burkhead, 1993; Scott and Crossman, 1973	Incidental commercial	Historically important as a food fish, but less so today. Is considered the best tasting of all the suckers.	Scott and Crossman, 1973; Becker, 1983; Jenkins and Burkhead, 1993
greater redhorse	p	p	Scott and Crossman, 1973; Trautman, 1981; Becker, 1983	Occasional recreational; Incidental commercial	Is seldom taken by angling, and likely is only a small proportion of the commercial catch of coarse fishes	Inferred from Scott and Crossman, 1973 and Becker, 1983.
BULLHEAD CATFISHES						
black bullhead	p	p	Scott and Crossman, 1973	Occasional recreational; Incidental commercial		Scott and Crossman, 1973; Becker, 1983
yellow bullhead	p	p	Scott and Crossman, 1973	Occasional recreational; Incidental commercial		Scott and Crossman, 1973; Becker, 1983
brown bullhead	p	p	Scott and Crossman, 1973	Occasional recreational; Incidental commercial		Scott and Crossman, 1973; Becker, 1983
channel catfish	p	p	Scott and Crossman, 1973	Commercial; Occasional recreational	Excellent food fish. Important commercial fish in some areas, especially in the US where it is farmed. Important sportfish.	Scott and Crossman, 1973
stonecat	o	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
tadpole madtom	p	p	Scott and Crossman, 1973	None	None in Canada, but considered excellent bait in the US	Scott and Crossman, 1973
margined madtom		p	Goodchild, 1990a; Jenkins and Burkhead, 1993	None	Commonly used as bait for smallmouth bass in the US	Jenkins and Burkhead, 1993
brindled madtom	p	p	Parker and McKee, 1987	None		Scott and Crossman, 1973
northern madtom	o	p	Inferred from Goodchild, 1993c and Etnier and Starnes, 1993	None		Goodchild, 1993c
flathead catfish	p	p	Jenkins and Burkhead, 1993	None	Recreational fishery in the US	Becker, 1983
PIKES						
redfin pickerel	o	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	None	None in Canada, but is sometimes angled for in the US and historically it was part of the commercial catch in the US.	Scott and Crossman, 1973
grass pickerel	o	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
northern pike	p	p	Scott and Crossman, 1973	Recreational; Commercial		Scott and Crossman, 1973
muskellunge	p	p	Scott and Crossman, 1973	Recreational; Historical commercial	Historically an important commercial fish, but now is an important gamefish	Scott and Crossman, 1973
chain pickerel	p	p	Scott and Crossman, 1973	Occasional recreational; Incidental commercial		Scott and Crossman, 1973
MUDMINNOWS						
Alaska blackfish	p	p	Scott and Crossman, 1973; McPhail and Lindsey, 1970	Historical Aboriginal		Scott and Crossman, 1973
central mudminnow	o	p	Becker, 1983; Scott and Crossman, 1973	Bait		Scott and Crossman, 1973
SMELTS						
pond smelt	p	p	Scott and Crossman, 1973	Aboriginal; Commercial		Scott and Crossman, 1973; Coad *et al.*, 1995
surf smelt		o	Inferred from Coad *et al.*, 1995	Commercial; Recreational; Subsistence	Considered a delicacy.	Hart, 1973; Coad *et al.*, 1995
rainbow smelt	p		Scott and Crossman, 1973	Commercial; Recreational		Scott and Crossman, 1973
pygmy smelt	p		Inferred from Coad *et al.*, 1995	Unknown	Possibly fished during the spawning run within their limited distribution. Recreational fishing could occur similar to that of rainbow smelt. Likely too limited in distribution to be a commercial species.	
longfin smelt	p	o	Scott and Crossman, 1973; Wydoski and Whitney, 1979	None	None in Canada, but a small amount are taken in the US	Scott and Crossman, 1973; Wydoski and Whitney, 1979
eulachon		o	Scott and Crossman, 1973; Wydoski and Whitney, 1979	Aboriginal; Incidental commercial		Scott and Crossman, 1973
TROUTS						

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
cisco (lake herring)	p	o	Scott and Crossman, 1973	Commercial		Scott and Crossman, 1973
Arctic cisco		p	Scott and Crossman, 1973	Aboriginal	Native fishery, and a small commercial fishery in Alaska	Coad *et al.*, 1995
bloater	p		Scott and Crossman, 1973	Incidental commercial	Not very important in Canada, but is the bulk of the deepwater ciscoe fishery in the US.	Scott and Crossman, 1973; Becker, 1983; Coad *et al.*, 1995
kiyi	p		Scott and Crossman, 1973	Historical commercial; Incidental commercial	Historically important Lake Ontario fishery, which is now likely extinct. Still caught as a minor part of the fishery in Lake Superior, and maybe to a lessor extent in lakes Huron and Michigan, but possibly extinct in these two lakes also.	Scott and Crossman, 1973; Becker, 1983
Bering cisco		p	McPhail and Lindsey, 1970; Edge, 1991	None	Potential fishery, but not presently exploited	Scott and Crossman, 1973; Edge, 1991
blackfin cisco	p		Scott and Crossman, 1973; Parker, 1989a	Historical commercial; Incidental commercial	Historically important commercial fish in the Great Lakes, but no longer. Still part of commercial catch is some inland lakes of Ontario and Manitoba.	Scott and Crossman, 1973
shortnose cisco	p		Scott and Crossman, 1973	Historical commercial		Scott and Crossman, 1973
least cisco	p	p	Scott and Crossman, 1973	Aboriginal		Coad *et al.*, 1995
shortjaw cisco	p		Scott and Crossman, 1973; Houston, 1988b	Historical commercial	Historically important commercial fish in the Great Lakes. Classed as "threatened" in Canada in 1987.	Scott and Crossman, 1973;Becker, 1983; Coad *et al.*, 1995
Atlantic whitefish	p	p	Edge, 1984	Occasional recreational	Local fishery, angling	Scott and Crossman, 1973; Edge, 1984
lake whitefish	p	p	Scott and Crossman, 1973	Commercial	Important commercial fish	Scott and Crossman, 1973
broad whitefish	o	p	Scott and Crossman, 1973	Subsistence	Fished locally for human and dog food.	Scott and Crossman, 1973; Coad *et al.*, 1995
pygmy whitefish	p	p	McPhail and Lindsey, 1970	None		Scott and Crossman, 1973
round whitefish	p	p	Scott and Crossman, 1973	Incidental commercial	Minor commercial importance in Canada, due to its small size and fluctuating supply	Scott and Crossman, 1973
mountain whitefish	p	p	Scott and Crossman, 1973; Northcote and Ennis, 1994	Recreational	Popular game fishery	Scott and Crossman, 1973; Northcote and Ennis, 1994
inconnu	p	p	McPhail and Lindsey, 1970; Coad *et al.*, 1995	Commercial; Occasional recreational	Fished commercially, and is a sport fish in Alaska	Coad *et al.*, 1995
golden trout	p	p	Wydoski and Whitney, 1979; Nelson and Paetz, 1992	Recreational		Wydoski and Whitney, 1979; Nelson and Paetz, 1992
cutthroat trout	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973
pink salmon	p	o	Scott and Crossman, 1973; Becker, 1983	Commercial; Occasional recreational	Important commercial species, but not as highly regarded as other salmons. Some angling for it occurs.	Scott and Crossman, 1973; Becker, 1983; Coad *et al.*, 1995
chum salmon		o	Scott and Crossman, 1973	Commercial		Scott and Crossman, 1973

[illegible]	Habitat (p=preferred; o=occurs)			[illegible]	[illegible]	[illegible]
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
coho salmon	p	o	Scott and Crossman, 1973; Becker, 1983	Commercial; Recreational		Scott and Crossman, 1973; Becker, 1983
rainbow trout	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973; Becker, 1983
sockeye salmon	p	o	Scott and Crossman, 1973	Commercial; Recreational		Scott and Crossman, 1973
chinook salmon	p	o	Scott and Crossman, 1973; Becker, 1983	Commercial; Recreational		Scott and Crossman, 1973
Atlantic salmon	p		Scott and Crossman, 1973; Smith, 1985	Commercial; Recreational		Scott and Crossman, 1973
brown trout	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973
Arctic char	p	o	Scott and Crossman, 1973	Commercial; Recreational		Scott and Crossman, 1973
bull trout	p	p	Coad *et al.*, 1995; Nelson and Paetz, 1992	Recreational		Coad *et al.*, 1995
brook trout	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973
Aurora trout	p		Parker and Brousseau, 1988.	?		
Dolly Varden	p	p	Scott and Crossman, 1973; Coad *et al.*, 1995	Occasional recreational	Not as popular as other salmonids	Coad *et al.*, 1995
lake trout	p	o	Scott and Crossman, 1973	Commercial; Recreational		Scott and Crossman, 1973
Arctic grayling	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973
TROUT-PERCHES						
trout-perch	p	p	Scott and Crossman, 1973	Occasional bait		Scott and Crossman, 1973
CODS						
burbot	p	o	Scott and Crossman, 1973	Occasional recreational		Scott and Crossman, 1973
Atlantic tomcod	p	p	Scott and Crossman, 1973	Commercial; Recreational		Scott and Crossman, 1973
KILLIFISHES						
banded killifish	p	p	Becker, 1983	Bait		Scott and Crossman, 1973
mummichog	p	p	Scott and Crossman, 1973; Jenkins and Burkhead, 1993; Coad *et al.*, 1995	Bait		Scott and Crossman, 1973
blackstripe topminnow		p	McAllister, 1987b	None		Becker, 1983
SILVERSIDES						
brook silverside	p	p	Goodchild, 1990b; Becker, 1983	Bait		Scott and Crossman, 1973
STICKLEBACKS						
fourspine stickleback	p	p	Scott and Crossman, 1973; Smith, 1985	Occasional bait		Scott and Crossman, 1973

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
brook stickleback	p	p	Scott and Crossman, 1973; Smith, 1985	Occasional bait		Scott and Crossman, 1973
threespine stickleback	p	p	Scott and Crossman, 1973; G. Coker personal observation	None		Scott and Crossman, 1973
blackspotted stickleback		o	Scott and Crossman, 1973; Coad *et al.*, 1995	None		Scott and Crossman, 1973
ninespine stickleback	p	p	Coad *et al.*, 1995	None		Scott and Crossman, 1973
SCULPINS						
coastrange sculpin	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
prickly sculpin	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
mottled sculpin	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
slimy sculpin	p	p	Scott and Crossman, 1973	Occasional bait	Occasionally as bait for trout fishing	Scott and Crossman, 1973
shorthead sculpin	o	p	Scott and Crossman, 1973; Wydoski and Whitney, 1979	None		Scott and Crossman, 1973
torrent sculpin	p	p	Wydoski and Whitney, 1979; Scott and Crossman, 1973	None		Scott and Crossman, 1973
spoonhead sculpin	p	p	McPhail and Lindsey, 1970; Houston, 1990a	None		Scott and Crossman, 1973
fourhorn sculpin	o	o	Houston, 1990b	None		Inferred from Houston, 1990b
deepwater sculpin		p	Parker, 1988a	None		Scott and Crossman, 1973
TEMPERATE BASSES						
white perch	p	o	Scott and Crossman, 1973; Smith, 1985	Incidental commercial; Occasional recreational		Scott and Crossman, 1973; Coad *et al.*, 1995
white bass	p	o	Scott and Crossman, 1973; Smith, 1985	Incidental commercial; Occasional recreational		Scott and Crossman, 1973; Coad *et al.*, 1995
striped bass	o	p	Jenkins and Burkhead, 1993; Smith, 1985	Incidental commercial; Occasional recreational		Scott and Crossman, 1973; Coad *et al.*, 1995
SUNFISHES						
rock bass	p	p	Scott and Crossman, 1973	Incidental commercial; Occasional recreational		Scott and Crossman, 1973
redbreast sunfish	p	p	Houston, 1990c	Occasional recreational	Generally unexploited in Canada	Scott and Crossman, 1973
green sunfish	p	p	Meredith and Houston, 1988b	Occasional recreational	None, except possible angling by children	Scott and Crossman, 1973
pumpkinseed	p	p	Scott and Crossman, 1973	Incidental commercial; Occasional recreational	Some commercial catch, and has some importance as a sportfish	Scott and Crossman, 1973
warmouth	p	p	Jenkins and Burkhead, 1993; Carlander, 1969	None	Known as an excellent small sport fish in the US, but is often difficult to catch due to its weedy habitat. Rating	Becker, 1983

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
					given based on this and the limited range in Canada	
orangespotted sunfish	p	p	Trautman, 1981; Noltie, 1990	None	Some angling in the US, but generally unexploited in Canada. Rating given based on this and the limited range in Canada.	Inferred from Noltie, 1990
bluegill	p	p	Scott and Crossman, 1973	Recreational	Important sport fish in the US. Less so in Canada, but still an important pan-fish.	Scott and Crossman, 1973
longear sunfish	p	p	Meredith and Houston, 1988a	None		Scott and Crossman, 1973
smallmouth bass	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973
largemouth bass	p	p	Scott and Crossman, 1973	Recreational		Scott and Crossman, 1973
white crappie	p	p	Scott and Crossman, 1973	Occasional recreational	Important in US, but too rare to be of importance as a sport fish in Canada; some locally important pan fisheries	Scott and Crossman, 1973; Personal observation, G. Coker.
black crappie	p	p	Scott and Crossman, 1973	Recreational; Incidental commercial	Locally important as a commercial fish in certain areas, but an important sportfish over the whole of its range	Scott and Crossman, 1973
PERCHES						
eastern sand darter	p	p	Scott and Crossman, 1973; Trautman, 1981; Facey, 1995	None		Scott and Crossman, 1973
greenside darter		p	Dalton, 1991	None		Scott and Crossman, 1973
rainbow darter		p	Scott and Crossman, 1973; Smith, 1985	None		Scott and Crossman, 1973
Iowa darter	p	p	Scott and Crossman, 1973; Smith, 1985	None		Scott and Crossman, 1973
fantail darter		p	Scott and Crossman, 1973; Smith, 1985	None		Scott and Crossman, 1973
least darter	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
johnny darter	p	p	Scott and Crossman, 1973	None		Scott and Crossman, 1973
tessellated darter	p	p	Goodchild, 1993d	None		Goodchild, 1993d
logperch	p	p	Scott and Crossman, 1973	Occasional bait		Scott and Crossman, 1973
channel darter	p	p	Trautman, 1981; Goodchild, 1993e; Etnier and Starnes, 1993	None		Scott and Crossman, 1973
blackside darter		p	Scott and Crossman, 1973; Smith, 1985	None		Scott and Crossman, 1973
river darter	p	p	Dalton, 1990b; Scott and Crossman, 1973	None		Scott and Crossman, 1973
ruffe	p	p	Inferred from Coad *et al.*, 1995; Ogle, 1995	None		Coad *et al.*, 1995
yellow perch	p	p	Scott and Crossman, 1973;	Commercial; Recreational		Scott and Crossman, 1973

	Habitat (p=preferred; o=occurs)					
COMMON NAME	Lake	Stream	Reference	Status of fishery	Comments	Reference
			Smith, 1985			
sauger	p	p	Scott and Crossman, 1973; Smith, 1985	Commercial; Recreational		Scott and Crossman, 1973
walleye	p	p	Scott and Crossman, 1973; Smith, 1985	Commercial; Recreational		Scott and Crossman, 1973
DRUMS						
freshwater drum	p	p	Scott and Crossman, 1973; Smith, 1985	Commercial		Scott and Crossman, 1973
GOBIES						
round goby	p	p	Coad *et al.*, 1995	None	Important fishery in the Black Sea, but not in Canada.	Coad *et al.*, 1995
tubenose goby	p	p	Coad *et al.*, 1995	None	Listed as endangered in Russia	Jude *et al.*, 1992

Table 2. Preferred temperature and temperature classification (warm > 25, cool 19-25, cold <19). All temperatures in Celcius degrees.

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
LAMPREYS						
chestnut lamprey	cool/warm	habitat; distribution	Becker, 1983;Scott and Crossman, 1973			
northern brook lamprey	cool	habitat	Becker, 1983;Scott and Crossman, 1973			
silver lamprey	cool/warm	habitat; typical host fishes	Becker, 1983;Scott and Crossman, 1973			
American brook lamprey	cold	habitat	Scott and Crossman, 1973			
river lamprey	cold	habitat; distribution; typical host fishes	Scott and Crossman, 1973			
Arctic lamprey	cold	distribution; typical host fishes	Scott and Crossman, 1973			
Vancouver Island lamprey	cold	salmonid hosts	Beamish, 1982			
western brook lamprey	cold/cool	habitat	Scott and Crossman, 1973			
Pacific lamprey	cold	distribution; typical host fishes	Scott and Crossman, 1973			
darktail lamprey	cold	distribution	Houston, 1991			
sea lamprey	cold	preferred temperature		6-15		Wismer and Christie, 1987
STURGEONS						
shortnose sturgeon	cold/cool	habitat; distribution	Scott and Crossman, 1973; Dadswell, 1984			
lake sturgeon	cold/cool	preferred temperature; distribution	Scott and Crossman, 1973	15-17		Wismer and Christie, 1987
green sturgeon	cold	habitat; distribution	Scott and Crossman, 1973			
Atlantic sturgeon	cold/cool	habitat; distribution	Scott and Crossman, 1973			
white sturgeon	cold/cool	habitat; distribution	Scott and Crossman, 1973			
GARS						
longnose gar	warm	preferred temperature		33.1		Coutant, 1977
spotted gar	warm	description of habitat appears to warrant at least "cool" habitat, despite the preferred temp in Wismer and Christie, 1987	Trautman, 1981; Parker and McKee, 1984a	16		Wismer and Christie, 1987
BOWFINS						
bowfin	warm	preferred temperature		30.5		Minns *et al.*, 1993
MOONEYES						
goldeye	warm	preferred temperature		27-29		Becker, 1983
mooneye	cool/warm	preferred temperature		22-27		Coutant, 1977

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
EELS						
American eel	cool	preferred temperature		19.0		Minns *et al.*, 1993
HERRINGS						
blueback herring	cold	preferred temperature		<13	Adults at sea	Jenkins and Burkhead, 1993
alewife	cold	preferred temperature		18.8		Coutant, 1977
American shad	cold	preferred temperature		7-13	Adults at sea	Jenkins and Burkhead, 1993
gizzard shad	cool	preferred temperature		20.5		Coutant, 1977
CARPS and MINNOWS						
chiselmouth	cool	limited temperature information; habitat; distribution	Wydoski and Whitney, 1979; Cannings and Ptolemy, 1998			
central stoneroller	cool/warm	preferred temperature		19-27		Wismer and Christie, 1987
goldfish	warm	preferred temperature		27.9		Coutant, 1977
redside dace	cool	habitat temperature	McKee and Parker 1982			
lake chub	cold	seasonal movements; habitat; distribution	Scott and Crossman, 1973			
spotfin shiner	warm	preferred temperature	Jenkins and Burkhead, 1993	29.5		Wismer and Christie, 1987
common carp	warm	preferred temperature		29.7		Wismer and Christie, 1987
gravel chub	cool	limited temperature information; habitat; distribution	Parker *et al.*, 1988a			
cutlips minnow	warm	habitat	Scott and Crossman, 1973			
western silvery minnow	cool/warm	habitat; distribution	Nelson and Paetz, 1992; Fishbase; Trautman, 1981; Scott and Crossman, 1973			
brassy minnow	cool	habitat	Scott and Crossman, 1973			
eastern silvery minnow	cool/warm	habitat; distribution	Scott and Crossman, 1973			
striped shiner	cool	habitat	Jenkins and Burkhead, 1993			
common shiner	cool	preferred temperature	Jenkins and Burkhead, 1993	21.9	Humber River, Ontario	Wichert and Lin, 1996
redfin shiner	cool	preferred temperature	Becker, 1983	20.5	Mean temperature at 83 locations where this species occurred	Noltie, 1989
silver chub	cool	habitat; temperature requirement	Becker, 1983			
pearl dace	cold/cool	preferred temperature	Scott and Crossman, 1973	16.2		Becker, 1983
peamouth	cool	habitat; distribution	Scott and Crossman, 1973			
hornyhead chub	cool	habitat; distribution	Scott and Crossman, 1973			
river chub	cool	preferred temperature		21.7	Humber River, Ontario	Wichert and Lin, 1996

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
golden shiner	cool	preferred temperature		23.84		Cincotta and Stauffer, 1984
pugnose shiner	cool	despite the low preferred temperature in Wismer and Christie, 1987, habitat and spawning temperatures suggest it should be at least classed as cool, and maybe cool/warm	Becker, 1983	15-18		Wismer and Christie, 1987
emerald shiner	cool	preferred temperature		22-24; 25		Wismer and Christie, 1987; Becker, 1983
bridle shiner	cool	habitat; distribution	Jenkins and Burkhead, 1993; Becker, 1983; Scott and Crossman, 1973			
river shiner	cool	habitat; distribution	Smith, 1979; Phillips *et al.*, 1982			
ghost shiner	warm	habitat; distribution	Becker, 1983			
bigmouth shiner	warm	habitat; distribution	Smith, 1979			
blackchin shiner	cool/warm	habitat; distribution	Scott and Crossman, 1973			
blacknose shiner	cool/warm	habitat; distribution	Scott and Crossman, 1973			
spottail shiner	cold/cool	preferred temperature; habitat; distribution	Becker, 1983	14.3		Coutant, 1977
silver shiner	cool/warm	habitat temperature; habitat; distribution	Baldwin, 1988			
rosyface shiner	warm	preferred temperature		26.8		Wismer and Christie, 1987
sand shiner	warm	upper lethal temperature; habitat	Jenkins and Burkhead, 1993; Wismer and Christie, 1987			
weed shiner	warm	habitat; distribution	Becker, 1983; Smith, 1979; Phillips *et al.*, 1982			
mimic shiner	warm	habitat; distribution	Jenkins and Burkhead, 1993; Trautman, 1981			
pugnose minnow	cool/warm	habitat; distribution	Scott and Crossman, 1973; Smith, 1979; Trautman, 1981			
northern redbelly dace	cool/warm	preferred temperature;habitat; distribution	Scott and Crossman, 1973	25.3		Stauffer *et al.*, 1980
finescale dace	cool	habitat; distribution	Scott and Crossman, 1973			
bluntnose minnow	warm	preferred temperature		29		Coutant, 1977
fathead minnow	warm	preferred temperature		29		Coutant, 1977
flathead chub	cool	habitat; distribution	Scott and Crossman, 1973			
northern squawfish	cold/cool	preferred temperature; habitat	Wydoski and Whitney, 1979	16-22		Vigg and Burley, 1991
blacknose dace	cool	preferred temperature		24.63		Cincotta and Stauffer, 1984
longnose dace	cool	preferred temperature		20.6	Humber River, Ontario	Wichert and Lin, 1996

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
leopard dace	cold	upper lethal temperature; habitat	Peden, 1991; Carlander, 1969		Limited to areas with August water temperatures of 15 - 18.	Peden, 1991
speckled dace	cold/cool	habitat	Wydoski and Whitney, 1979			
Umatilla dace	cool/warm	habitat	Cannings and Ptolemy, 1998			
redside shiner	cold/cool	upper lethal temperature; distribution	Scott and Crossman, 1973			
rudd	cool	avoidance temperature; habitat	Coutant, 1977; Smith, 1985			
creek chub	cool	preferred temperature		20.8	Humber River, Ontario	Wichert and Lin, 1996
fallfish	cool	habitat; upper avoidance temperature	Wismer and Christie, 1987; Scott and Crossman, 1973			
tench	cool	upper avoidance temperature	Coutant, 1977			
SUCKERS						
quillback	cool	preferred temperature		22.1		Coutant, 1977
longnose sucker	cold	preferred temperature		8-17		Wismer and Christie, 1987
bridgelip sucker	cold	habitat and distribution	Crossman, 1973; Dauble, 1980			
white sucker	cool	preferred temperature		22.4		Spotila *et al.*, 1979
largescale sucker	cool	upper lethal temperature; habitat; distribution	Scott and Crossman, 1973			
mountain sucker	cool	preferred temperature		13-21	Summer	Wydoski and Whitney, 1979
lake chubsucker	warm	preferred temperature		28.2-34.0	At acclimization temperatures of 15-25.	Negus *et al.*, 1986
northern hog sucker	warm	preferred temperature		26.6	Humber River, Ontario	Wichert and Lin, 1996
bigmouth buffalo	warm	preferred temperature; habitat	Goodchild, 1990c; Becker, 1983; Trautman, 1981; Scott and Crossman, 1973	18-26		Wismer and Christie, 1987
black buffalo	warm	habitat	Becker, 1983			
spotted sucker	warm	preferred temperature		25-27		Wismer and Christie, 1987
silver redhorse	cool	habitat	Jenkins and Burkhead, 1993; Scott and Crossman, 1973			
river redhorse	cool	habitat	Parker and McKee, 1984c			
black redhorse	cool/warm	habitat	Jenkins and Burkhead, 1993			
golden redhorse	warm	preferred temperature; habitat	Jenkins and Burkhead, 1993; Becker, 1983	26-27.5	Wild population	Becker, 1983
copper redhorse	cool/warm	habitat	Mongeau *et al.*, 1992			
shorthead redhorse	warm	preferred temperature		26-27.5		Wismer and Christie, 1987
greater redhorse	cool/warm	habitat	Scott and Crossman, 1973; Trautman, 1981; Becker, 1983			
BULLHEAD						

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
CATFISHES						
black bullhead	warm	distribution; habitat; various temperature data	Becker,1983; Stuber, 1982; Wismer and Christie, 1987		Avoided temperatures of 35.	Wismer and Christie, 1987
yellow bullhead	warm	preferred temperature		28.3		Wismer and Christie, 1987
brown bullhead	warm	preferred temperature		24.9; 27.3		Coutant, 1977; Richards and Ibara, 1978
channel catfish	warm	preferred temperature		25.2		Coutant, 1977
stonecat	warm	preferred temperature		25.1		Wismer and Christie, 1987; Wichert and Lin, 1996
tadpole madtom	warm	habitat; distribution; lethal temperature	Scott and Crossman, 1973; Wismer and Christie, 1987; Becker, 1983			
margined madtom	cool/warm	habitat	Jenkins and Burkhead, 1993			
brindled madtom	warm	spawning temperature; habitat; distribution	Etnier and Starnes, 1993			
northern madtom	warm	habitat, distribution	Goodchild, 1993c; Etnier and Starnes, 1993			
flathead catfish	warm	preferred temperature		31.5-33.5		Becker, 1983; Lee and Terrell, 1987
PIKES						
redfin pickerel	warm	preferred temperature		26		Spotila *et al.*, 1979
grass pickerel	warm	preferred temperature		26		Wismer and Christie, 1987
northern pike	cool	preferred temperature		22.5	2-3 degrees above optimum growth temperature of 19.8 (natural) and 20.9 (lab).	Casselman and Lewis, 1996
muskellunge	warm	preferred temperature		25.6		Scott and Crossman, 1973
chain pickerel	cool/warm	preferred temperature; habitat; distribution	Jenkins and Burkhead, 1993	24		Coutant, 1977
MUDMINNOWS						
Alaska blackfish	cool	habitat; distribution	Scott and Crossman, 1973; McPhail and Lindsey, 1970			
central mudminnow	cool/warm	habitat; lethal temperature	Martin-Bergmann and Gee, 1985; Scott and Crossman, 1973			
SMELTS						
pond smelt	cold	habitat; distribution	Scott and Crossman, 1973			
surf smelt	cold	habitat; distribution	Coad *et al.*, 1995			
rainbow smelt	cold	preferred temperature; habitat; behaviour	Scott and Crossman, 1973	15		Wismer and Christie, 1987

COMMON NAME	Class	Basis for classification	Reference	Preferred temper-ature	Comments	Reference
pygmy smelt	cold	sympatric with rainbow smelt	Coad *et al.*, 1995			
longfin smelt	cold	habitat; distribution	Wydoski and Whitney, 1979			
eulachon	cold	habitat; distribution	Scott and Crossman, 1973			
TROUTS						
cisco (lake herring)	cold	preferred temperature		13-18		Spotila *et al.*, 1979
Arctic cisco	cold	habitat; distribution	Coad *et al.*, 1995			
bloater	cold	preferred temperature		7-10		Wismer and Christie, 1987
kiyi	cold	preferred temperature		3.7-4.6		Carlander,1969
Bering cisco	cold	habitat; distribution	McPhail and Lindsey, 1970; Edge, 1991			
blackfin cisco	cold	habitat, depth distribution	Scott and Crossman, 1973			
shortnose cisco	cold	habitat temperature	Becker, 1983			
least cisco	cold	habitat; distribution; predators	Scott and Crossman, 1973			
shortjaw cisco	cold	habitat; depth distribution	Scott and Crossman, 1973			
Atlantic whitefish	cold	habitat; sympatric species	Edge, 1984; Scott and Crossman, 1973			
lake whitefish	cold	preferred temperature		12.7		Ferguson, 1958
broad whitefish	cold	distribution; spawning temperature	Scott and Crossman, 1973; Coad *et al.*, 1995			
pygmy whitefish	cold	habitat	Scott and Crossman, 1973; McPhail and Lindsey, 1970; Wydoski and Whitney, 1979			
round whitefish	cold	preferred temperature		17.5		Coutant, 1977
mountain whitefish	cold	optimum growth temperature	Ford *et al.*. 1995			
inconnu	cold	habitat; distribution; food; predators	Scott and Crossman, 1973; Coad *et al.*, 1995; McPhail and Lindsey, 1970			
golden trout	cold	habitat; previously classified as a subspecies of rainbow trout.	Wydoski and Whitney, 1979; Nelson and Paetz, 1992			
cutthroat trout	cold	preferred temperature		<20		Ford *et al.*, 1995
pink salmon	cold	preferred temperature		11.7		Coutant, 1977
chum salmon	cold	preferred temperature		12-14; 14.1		Scott and Crossman, 1973; Coutant, 1977
coho salmon	cold	preferred temperature		16.6		Coutant, 1977
rainbow trout	cold	preferred temperature		11.3		Portt *et al.*, 1988
sockeye salmon	cold	preferred temperature		10-15		Wismer and Christie, 1987; Coad *et al.*, 1995
chinook salmon	cold	preferred temperature		17.3		Coutant, 1977
Atlantic salmon	cold	preferred temperature		16.0		Coutant, 1977

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
brown trout	cold/cool	preferred temperature		21.1		Minns *et al.*, 1993
Arctic char	cold	habitat; distribution				
bull trout	cold	habitat temperature	Ford *et al.*, 1995; Coad *et al.*, 1995			
brook trout	cold	preferred temperature		16.0		Cherry *et al.*, 1977
Aurora trout	cold	preferred temperature assumed same as brook trout		16.0	Assumed same as brook trout	Cherry *et al.*, 1977
Dolly Varden	cold	habitat; distribution	Scott and Crossman, 1973			
lake trout	cold	preferred temperature		10.0		Peterson *et al.* 1979
Arctic grayling	cold	habitat temperature	Ford *et al.*, 1995			
TROUT-PERCHES						
trout-perch	cold	preferred temperature		15-16		Wismer and Christie, 1987
CODS						
burbot	cold/cool	preferred temperature	Scott and Crossman, 1973	21.2		Spotila *et al.*, 1979
Atlantic tomcod	cold	habitat; distribution; migrations	Scott and Crossman, 1973			
KILLIFISHES						
banded killifish	cool	preferred temperature in freshwater		21	Freshwater	Garside and Morrison, 1977
mummichog	cool	preferred temperature in freshwater		22	Freshwater	Garside and Morrison, 1977
blackstripe topminnow	cool/warm	habitat	McAllister, 1987b; Becker, 1983; Etnier and Starnes, 1993			
SILVERSIDES						
brook silverside	cool/warm	preferred temperature, habitat	Goodchild, 1990b; Becker, 1983	24.5		Wismer and Christie, 1987
STICKLEBACKS						
fourspine stickleback	cold	habitat; distribution	Scott and Crossman, 1973; Smith, 1985			
brook stickleback	cool	preferred temperature		21.3	Humber River, Ontario	Wichert and Lin, 1996
threespine stickleback	cold	preferred temperature		9-12		Lachance *et al.*, 1987
blackspotted stickleback	cold	preferred temperature		11-14		Lachance *et al.*, 1987
ninespine stickleback	cold	preferred temperature		9-10 and 15-16	Bimodal preference.	Lachance *et al.*, 1987
SCULPINS						
coastrange sculpin	cold	habitat; distribution; predators	Scott and Crossman, 1973; Wydoski and Whitney, 1979			
prickly sculpin	cold	habitat temperature	Wydoski and Whitney, 1979			
mottled sculpin	cold	preferred temperature		16.6		Wismer and Christie, 1987
slimy sculpin	cold	preferred temperature		10; 13	Lab study in Symons *et al.*,	Otto and Rice, 1977;

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
					1976	Symons *et al.*, 1976
shorthead sculpin	cold	habitat temperature	Wydoski and Whitney, 1979			
torrent sculpin	cold	habitat; distribution; food	Wydoski and Whitney, 1979; Scott and Crossman, 1973			
spoonhead sculpin	cold	habitat	McPhail and Lindsey, 1970; Houston, 1990a; Becker, 1983			
fourhorn sculpin	cold	habitat temperature	Coad *et al.*, 1995			
deepwater sculpin	cold	preferred temperature; habitat depth	Parker, 1988a; Scott and Crossman, 1973	4-4.5	Range of lower and upper avoidance temperatures in Wismer and Christie (1987)	Wismer and Christie, 1987; Coutant, 1977
TEMPERATE BASSES						
white perch	warm	preferred temperature		32.0	Hall *et al.*, 1978 closely agrees.	Coutant, 1977
white bass	warm	preferred temperature		29.0		Coutant, 1977
striped bass	cool	preferred temperature		21.6		Van Den Avyle and Evans, 1990
SUNFISHES						
rock bass	cool	preferred temperature		20.5	Adult in lab in spring	Coutant, 1977.
redbreast sunfish	warm	habitat; lethal temperature	Scott and Crossman, 1973; Jenkins and Burkhead, 1993; Houston, 1990c			
green sunfish	warm	preferred temperature		30.6		Coutant, 1977
pumpkinseed	warm	preferred temperature		26.0		Portt *et al.*, 1988
warmouth	warm	habitat; distribution	Jenkins and Burkhead, 1993; Carlander, 1969			
orangespotted sunfish	warm	habitat; distribution	Trautman, 1981; Noltie, 1990			
bluegill	warm	preferred temperature		30.9		Cherry *et al.*, 1977
longear sunfish	warm	habitat; lethal temperature	Scott and Crossman, 1973; Jenkins and Burkhead, 1993; Wismer and Christie, 1987			
smallmouth bass	warm	preferred temperature		30.3		Cherry *et al.*, 1977
largemouth bass	warm	preferred temperature		30.2		Portt *et al.*, 1988
white crappie	cool	preferred temperature	Coutant, 1977	19.4		Wismer and Christie, 1987
black crappie	cool	preferred temperature		21.7		Wismer and Christie, 1987
PERCHES						
eastern sand darter	cool/warm	preferred temperature; habitat	Daniels, 1993; Scott and Crossman, 1973; Trautman, 1981; Facey, 1995	24, 25, 25.5		Scott and Crossman, 1973; Facey, 1995
greenside darter	cool/warm	preferred temperature; habitat	Jenkins and Burkhead, 1993	25.4		Hlohowskyj and Wissing,

COMMON NAME	Class	Basis for classification	Reference	Preferred temperature	Comments	Reference
						1987
rainbow darter	cool	preferred temperature		19.8		Wichert and Lin, 1996
Iowa darter	cool	preferred temperature		12-25		Wismer and Christie, 1987
fantail darter	cool	preferred temperature		22.4		Ingersoll and Claussen, 1984
least darter	cool/warm	habitat temperature	Becker, 1983			
johnny darter	cool	preferred temperature		22.8		Ingersoll and Claussen, 1984
tessellated darter	cool	preferred temperature		22.8		Ingersoll and Claussen, 1984
logperch	cool/warm	habitat; distribution	Jenkins and Burkhead, 1993; Scott and Crossman, 1973			
channel darter	cool/warm	habitat; distribution	Trautman, 1981; Goodchild, 1993e; Etnier and Starnes, 1993			
blackside darter	cool	habitat temperature	Becker, 1983			
river darter	cool/warm	habitat; distribution	Dalton, 1990b; Becker, 1983			
ruffe	cool	optimum growth temperature	Edsall *et al.*, 1993; Ogle, 1995			
yellow perch	cool	preferred temperature		21.4		Coutant, 1977
sauger	cool	preferred temperature		19.2		Coutant, 1977
walleye	cool	preferred temperature		22		Wismer and Christie, 1987
DRUMS						
freshwater drum	warm	preferred temperature		26.5		Wismer and Christie, 1987; Spotila *et al.*, 1979
GOBIES						
round goby	cool	habitat temperature	Marsden *et al.*, 1996			
tubenose goby	cool/warm	habitat	Coad *et al.*, 1995			

Table 3. Feeding location and method, and diet.

Bo=bottom, Pe=pelagic, Su=surface, No=nonfeeding, Fi=filter, Gr=grazing and picking, So=sort, St=Stalk, Pu=pursuit, Am=ambush, Ph=phytoplankton, Ma=macrophytes which includes algal clumps or attached filamentous algae, Cr=crustaceans, An=annelids, Mo=molluscs, In=insects, Fi=fish, Pa=parasitic, Ot=other. Specific food items listed under Comment refer to the Other diet class. Preference level is coded as high (1), medium (2), and low (3).

	Location			Method							Diet										
COMMON NAME	Bo	Pe	Su	No	Fi	Gr	So	St	Pu	Am	Ph	Ma	Cr	An	Mo	In	Fi	Pa	Ot	Comments	Reference
LAMPREYS																					
chestnut lamprey		1							1									1			Scott and Crossman, 1973
northern brook lamprey				1																	Scott and Crossman, 1973
silver lamprey		1							1									1			Scott and Crossman, 1973
American brook lamprey				1																	Scott and Crossman, 1973
river lamprey		1							1									1			Scott and Crossman, 1973
Arctic lamprey		1							1									1			Scott and Crossman, 1973
Vancouver Island lamprey		1							1									1			Cannings and Ptolemy, 1998
western brook lamprey				1																	Scott and Crossman, 1973
Pacific lamprey		1							1									1			Scott and Crossman, 1973
darktail lamprey				1																	Inferred from Houston, 1991
sea lamprey		1							1									1			Scott and Crossman, 1973
STURGEONS																					
shortnose sturgeon	1						1								1						Dadswell, 1984
lake sturgeon	1						1					3	1	1	1	1	1			Diet depends upon available items.	Scott and Crossman, 1973; Houston, 1987
green sturgeon	1						1						1		3	1	1			Assumed same as white sturgeon.	Houston, 1988a; Wydoski and Whitney, 1979
Atlantic sturgeon	1						1						1	1	1	1					Scott and Crossman, 1973
white sturgeon	1						1						1		3	1	1				Scott and Crossman, 1973; Hart, 1973
GARS																					
longnose gar		1								1			3				1		3	Frogs, small mammals	Scott and Crossman, 1973
spotted gar		1								1							1				Scott and Crossman, 1973
BOWFINS																					
bowfin	1	1	1			1		1					1			2	1		1	Frogs	Scott and Crossman, 1973
MOONEYES																					

	Location			Method						Diet										
COMMON NAME	Fo	Pe	Su	Ne	Fl	Gr	So	St	Pa	Am	Ph	Ma	Cr	An	Mo	In	Fl	Pa	Ot	Comments	Reference
goldeye	1	1	1						1				2		2	1	2		3	Frogs, small mammals	Scott and Crossman, 1973
mooneye	1	1	1						1				1		1	1	1				Scott and Crossman, 1973; Trautman, 1981
EELS																					
American eel	1	1							1				1	1	1	1	1				Scott and Crossman, 1973
HERRINGS																					
blueback herring		1			1								1								Jenkins and Burkhead, 1993
alewife	2	1			1								1								Scott and Crossman, 1973
American shad		1			1								1			1					Scott and Crossman, 1973
gizzard shad	1					1	1				1	1									Scott and Crossman, 1973
CARPS and MINNOWS																					
chiselmouth	1					1						1							1	Green algae and diatoms. Apparently only digests diatoms.	Scott and Crossman, 1973
central stoneroller	1					1						1							1	Epilithic and epiphytic non-motile diatoms, desmids, filamentous green and bluegreen algae, and associated flagellate unicells.	Fowler and Taber, 1985; McKee and Parker, 1982
goldfish	1						1					1	1	2	1	1					Scott and Crossman, 1973
redside dace	2		1						1							1					Scott and Crossman, 1973
lake chub	1					1	1					3	3			1	3				Scott and Crossman, 1973
spotfin shiner	2	1				3			1			3	1			1	3				Smith, 1979; Scott and Crossman, 1973; Jenkins and Burkhead, 1993
common carp	1						1					3	2	2	2	1					Scott and Crossman, 1973
gravel chub	1					1					2	2			3	1					Inferred from Scott and Crossman, 1973, Trautman. 1981, Jenkins and Burkhead, 1993; Parker *et al.*,1988a; Robison and Buchanan, 1988.
cutlips minnow	1	2				1	1						3	3	3	1			3	Fish eggs	Jenkins and Burkhead, 1993; Coad *et al.*, 1995
western silvery minnow	1					1						1									Nelson and Paetz, 1992; Inferred from Trautman, 1981 and Scott and Crossman, 1973
brassy minnow	1					1					1		1			2					Scott and Crossman, 1973
eastern silvery minnow	1					1						1									Scott and Crossman, 1973; Jenkins and Burkhead, 1993
striped shiner	1	1	1			1			2			2	2			1	2				Jenkins and Burkhead, 1993
common shiner	1	1	1			1			2			2	2	2		1					Jenkins and Burkhead, 1993
redfin shiner	3	1	1			1			2		3	3	2			1					Inferred from Becker, 1983; Noltie, 1989

	Location			Method						Diet										
COMMON NAME	Be	Pe	Su	Ne	Fl	Gr	[illegible]	[illegible]	Pr	Am	Ph	Ma	Cr	An	Mo	In	Fl	Ps	Ot	Comments	Reference
silver chub	1					1			2				3		3	1	3				Parker *et al.*, 1987a
pearl dace	1					1						3	1			1					Scott and Crossman, 1973
peamouth	1	1				1			2				1		2	1	3				Wydoski and Whitney, 1979
hornyhead chub	1	2	1			1			1		1	1	1	3		1	3				Scott and Crossman, 1973
river chub	1	1				2			1			2	3	3	3	1	3				Jenkins and Burkhead, 1993
golden shiner		1	1			1						2	1			1					Scott and Crossman, 1973
pugnose shiner	2	1				1	2		3			1	1								Becker, 1983
emerald shiner		1				1					2		1			2					Scott and Crossman, 1973
bridle shiner	1	1				1			2			3	1			1					Scott and Crossman, 1973; Jenkins and Burkhead, 1993
river shiner		1				1					2	3	1			1					Becker, 1983
ghost shiner		1				1					2		1			2				Diets of other species typically found in similar large river habitat was considered	Inferred from Smith, 1979 and Becker, 1983
bigmouth shiner	1	1	2			1	1		2			2	1			1					Inferred from Smith, 1979; Trautman, 1981; Carlander, 1969; Becker; 1983
blackchin shiner	1		1			1	1						1			1					Scott and Crossman, 1973
blacknose shiner		1	1			1							1			1					Scott and Crossman, 1973
spottail shiner	1	1				1						2	1			2	3				Scott and Crossman, 1973
silver shiner		1	1			2			1				3			1			3	Nematoda	Trautman, 1981; McKee and Parker, 1982
rosyface shiner	1	1	3			1			2			3				1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
sand shiner	1	1				1			2		3	3				1					Jenkins and Burkhead, 1993; Scott and Crossman, 1973
weed shiner		1				1					1	1							3	Unidentified invertebrates	Etnier and Starnes, 1993; Becker, 1983
mimic shiner		1				1						2	1			2					Scott and Crossman, 1973
pugnose minnow		1	1			1						1	1			1					Smith, 1979; Parker *et al.*, 1987b
northern redbelly dace	1					1					1	1	2			2					Scott and Crossman, 1973
finescale dace	1		1				1		1						1	1					Becker, 1983
bluntnose minnow	1						1					1	2	2		1					Scott and Crossman, 1973; Jenkins and Burkhead, 1993
fathead minnow	1						1					1	2			1					Scott and Crossman, 1973; Jenkins and Burkhead, 1993
flathead chub	1	1	1			1			1				3			1	3		3	Rodents, berries, etc.	Scott and Crossman, 1973; McPhail and Lindsey, 1970; Nelson and Paetz, 1992; Carlander, 1969
northern squawfish	1	1	1			1			1				2			2	1				Wydoski and Whitney, 1979; Scott and Crossman, 1973
blacknose dace	1					1					2			2		1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993

	Location			Method							Diet										
COMMON NAME	Be	Pe	Su	Ne	Fi	Gr	So	St	Fo	Am	Ph	Ma	Cr	An	Mo	In	Fi	Pa	Ot	Comments	Reference
longnose dace	1					1										1					Scott and Crossman, 1973
leopard dace	1	1	1			1			1		3	3				1					Wydoski and Whitney, 1979; Gee and Northcote, 1963
speckled dace	1					1						2	1			1					Wydoski and Whitney, 1979
Umatilla dace	1					1						2	1			1				Assumed to be same as speckled dace	Wydoski and Whitney, 1979; Cannings and Ptolemy, 1998
redside shiner	1	1	1			1			1			3			3	1	3				Scott and Crossman, 1973
rudd			1			1			1			3		1		1	3				Smith, 1985
creek chub	1		1			1			1			3	1			1	3				Scott and Crossman, 1973
fallfish	1		1			1			1				1			1	2				Scott and Crossman, 1973
tench	1					1									1	1					Scott and Crossman, 1973; Wydoski and Whitney, 1979
SUCKERS																					
quillback	1						1					1				1					Scott and Crossman, 1973
longnose sucker	1						1					3	1		1	1					Scott and Crossman, 1973
bridgelip sucker	1					1						1				3			3	Other unidentified aquatic invertebrates	Dauble, 1980
white sucker	1						1				2		1		1	1					Scott and Crossman, 1973
largescale sucker	1					1					3	3	1	3	2	1					Scott and Crossman, 1973; Wydoski and Whitney, 1979
mountain sucker	1					1						1				1					Scott and Crossman, 1973; Wydoski and Whitney, 1979
lake chubsucker	1					1						1	2		2	2					Becker, 1983
northern hog sucker	1					1						3	1		2	1			3	Fish eggs	Jenkins and Burkhead, 1993
bigmouth buffalo	1	2			3	1					3		1		3	2					Johnson, 1963; Goodchild, 1990c
black buffalo	1					1							2		1	1					Inferred from Becker, 1983
spotted sucker	1					1							1		3	1					Parker and McKee, 1984b; Becker, 1983
silver redhorse	1						1				3		1		2	1					Scott and Crossman, 1973
river redhorse	1					1							1		1	1					Jenkins and Burkhead, 1993
black redhorse	1					1						2	1			1					Bowman, 1970; Jenkins and Burkhead, 1993
golden redhorse	1					1						3	1		2	1					Inferred from Goodchild, 1990d; Scott and Crossman, 1973; Becker, 1983; Jenkins and Burkhead, 1993
copper redhorse	1					1						3	3		1	3					Mongeau *et al.*, 1992
shorthead redhorse	1						1				3		1		2	1					Scott and Crossman, 1973
greater redhorse	1					1						2	1		1	2					Becker, 1983
BULLHEAD CATFISHES																					
black bullhead	1					1			2			3	1	1	1	1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993

	Location			Method							Diet										
COMMON NAME	Be	Pe	Su	Nf	Fi	Gr	Se	St	Pu	Am	Ph	Ma	Cr	An	Mo	In	Fi	Pa	Ot	Comments	Reference
yellow bullhead	1					1			2			3	1	1	1	1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993; Becker, 1983
brown bullhead	1					1			2			2	1	1	1	1	3				Scott and Crossman, 1973
channel catfish	1		2			1			2			1	1		1	1	1				Scott and Crossman, 1973
stonecat	1					1			2			3	2		2	1	2				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
tadpole madtom	1					1			2				1			1					Scott and Crossman, 1973
margined madtom	1					1			2				1			1	3				Jenkins and Burkhead, 1993; Goodchild, 1990a
brindled madtom	1					1			2				1			1					Parker and McKee, 1987; Etnier and Starnes, 1993
northern madtom	1					1			2				1			1				Nothing apparently is known of the food of this fish, however, Goodchild (1993c) suggests that insects and inverts make up diet. We have assigned same feeding attributes as the brindled madtom.	
flathead catfish	1	2				1			2	2			2		2		1				Becker, 1983; Jenkins and Burkhead, 1993; Goodchild, 1993b
PIKES																					
redfin pickerel		1						1		1			2			2	1				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
grass pickerel		1						1		1			2			2	1				Crossman, 1962
northern pike		1	2					1		1			3				1		2	Small mammals, frogs, birds, etc.	Scott and Crossman, 1973
muskellunge		1	2					1		1							1		2	Small mammals, frogs, birds, etc.	Scott and Crossman, 1973
chain pickerel		1	2					1		1			2				1		2	Small mammals, frogs, birds, etc.	Scott and Crossman, 1973
MUDMINNOWS																					
Alaska blackfish	1					1		1					1		1	1					Scott and Crossman, 1973
central mudminnow	1	1	1			1		1		1			1	1	1	1	1				Martin-Bergmann and Gee, 1985
SMELTS																					
pond smelt		1			2	1					2		1			1					Coad *et al.*, 1995; Scott and Crossman, 1973
surf smelt	2	1				1			1				1	1		1	1		1	Comb jellies	Coad *et al.*, 1995
rainbow smelt	1	1				1			1				1	2		2	3				Scott and Crossman, 1973
pygmy smelt	2	1				1							1			1					Coad *et al.*, 1995

	Location			Method							Diet										
COMMON NAME	Be	Pe	Su	No	Fl	Gr	Se	St	Pu	Am	Ph	Ma	Cr	An	Mo	In	Fi	Pa	Ot	Comments	Reference
longfin smelt		1				1							1								Scott and Crossman, 1973; Wydoski and Whitney, 1979
eulachon		1				1							1								Scott and Crossman, 1973; Wydoski and Whitney, 1979
TROUTS																					
cisco (lake herring)	1	1	3			1			2				1			1	3				Scott and Crossman, 1973
Arctic cisco	1	1				1			1			2	1	1	1	1	2				Inferred from Scott and Crossman, 1973; Coad *et al.*, 1995
bloater	2	1				1							1		3	3					Scott and Crossman, 1973; Becker, 1983
kiyi	1	2				1							1								Scott and Crossman, 1973; Becker, 1983
Bering cisco	1	2				1			1				1				2				Inferred from McPhail and Lindsey, 1970; Scott and Crossman, 1973; Edge, 1991
blackfin cisco	1	2				1							1			3					Scott and Crossman, 1973
shortnose cisco	1	2				1							1		3	3					Scott and Crossman, 1973
least cisco	1	1	3		1	1			3				1	1	3	1	3			Principal feeding mode varies with population	Coad *et al.*, 1995
shortjaw cisco	1	2			2	1							1			3					Scott and Crossman, 1973
Atlantic whitefish	1					1							1	2	2	1					Edge, 1984; Scott and Crossman, 1973
lake whitefish	1					1	1						1	3	1	1	3				Scott and Crossman, 1973
broad whitefish	1					1							1		1	1					Scott and Crossman, 1973; Coad *et al.*, 1995
pygmy whitefish	1	1				1							1		1	1			3	Fish eggs may be important at times	Scott and Crossman, 1973; McPhail and Lindsey, 1970; Wydoski and Whitney, 1979
round whitefish	1					1	1					1	2			1	3				Scott and Crossman, 1973
mountain whitefish	1	2				1			2				2	3	3	1	3				Scott and Crossman, 1973; Ford *et al.*, 1995; Wydoski and Whitney, 1979
inconnu	1	1							1								1				Scott and Crossman, 1973; Coad *et al.*, 1995
golden trout	1	1	1			1							1			1					Wydoski and Whitney, 1979
cutthroat trout	1	1	1			1			1				1			1	1				Scott and Crossman, 1973
pink salmon		1							1				1								Scott and Crossman, 1973; Becker, 1983
chum salmon	1	1				1			1				1	1			1		1	Squid and a variety of other invertebrates	Wydoski and Whitney, 1979
coho salmon		1				2			1				2			2	1				Scott and Crossman, 1973; Becker, 1983
rainbow trout	1	1	1			1			1				2	2	3	1	3				Scott and Crossman, 1973
sockeye salmon	2	1	2			1							1			1					Scott and Crossman, 1973
chinook salmon		1							1								1				Scott and Crossman, 1973; Becker, 1983
Atlantic salmon		1							1				1				1				Scott and Crossman, 1973
brown trout		1	1						1				1		2	1	1		2	Salamanders, frogs, small mammals	Scott and Crossman, 1973

	Location			Method						Diet										
COMMON NAME	**Bo**	**Pe**	**Su**	**No**	**Fl**	**Gr**	**So**	**St**	**Pu**	**Am**	**Ph**	**Ma**	**Cr**	**An**	**Mo**	**In**	**Fl**	**Pa**	**Ot**	**Comments**	**Reference**
Arctic char	1	1				1			1				1			1	1			Diet varies greatly from place to place	Scott and Crossman, 1973
bull trout	1	1				1			1				2		2	2	1				Coad *et al.*, 1995
brook trout	1	1	1			1			1				1	1		1	2				Scott and Crossman, 1973
Aurora trout	1	1	1			1			1				1	1		1	2			Assumed same as brook trout	Scott and Crossman, 1973
Dolly Varden	1	1	1			1			1				1	1	1	1	1		3	Small mammals, frogs, birds	Scott and Crossman, 1973; Coad *et al.*, 1995; Nelson and Paetz, 1992
lake trout		1	1			1			1				2			3	1		3	Small mammals	Scott and Crossman, 1973; G. Coker, pers. obser.
Arctic grayling	1	1	1			1			1				1			1	3		3	Small mammals	Scott and Crossman, 1973
TROUT-PERCHES																					
trout-perch	1						1						1			1	3				Scott and Crossman, 1973
CODS																					
burbot	1	1				1			1				1			1	1		3	Fish eggs	Scott and Crossman, 1973
Atlantic tomcod	1	1				1			1				1	1	1		1		2	Squid	Scott and Crossman, 1973; Coad *et al.*, 1995; Smith, 1985
KILLIFISHES																					
banded killifish	1	1	1			1							1		3	1					Scott and Crossman, 1973
mummichog	1	1	1			1			1				1	1	1	1	1		2	Fish eggs	Scott and Crossman, 1973; Coad *et al.*, 1995
blackstripe topminnow	2	1	1			1			1			3	2		2	1					McAllister, 1987b
SILVERSIDES																					
brook silverside		1	1						1				1			1					Scott and Crossman, 1973
STICKLEBACKS																					
fourspine stickleback	1	2				1			2		1		1								Scott and Crossman, 1973
brook stickleback	1	1					1					3	1	3	3	1					Scott and Crossman, 1973
threespine stickleback	1	1				1			2				1	1	1	1	2		2	Fish eggs	Scott and Crossman, 1973
blackspotted stickleback	2	1				1							1		2	2			3	Fish eggs	Coad *et al.*, 1995
ninespine stickleback	1	1					1						1			1	3				Scott and Crossman, 1973
SCULPINS																					
coastrange sculpin	1					1			2					2	3	1	2		3	Fish eggs	Scott and Crossman, 1973; Wydoski and Whitney, 1979
prickly sculpin	1					1			1				1		1	1	1		3	Fish eggs	Scott and Crossman, 1973; Wydoski and Whitney, 1979; Coad *et al.*, 1995
mottled sculpin	1					1						3	2	3		1	3				Scott and Crossman, 1973
slimy sculpin	1					1		2	2			3	2	3		1	3				Scott and Crossman, 1973; Becker, 1983
shorthead sculpin	1					1										1	3				Peden and Hughes, 1984b; Hughes and Peden, 1984

	Location			Method							Diet										
COMMON NAME	Co	Pe	Su	No	El	Gr	So	St	Pu	Am	Ph	Ma	Cr	An	Mo	In	Fl	Pa	Ot	Comments	Reference
torrent sculpin	1					1			1					2		1	1				Scott and Crossman, 1973; Wydoski and Whitney, 1979
spoonhead sculpin	1					1		1	1			3	1	3		2					Becker, 1983
fourhorn sculpin	1					1		1	1				1	2		2	3				Houston, 1990b
deepwater sculpin	1					1		1	1				1			2					Parker, 1988a; Becker, 1983; McPhail and Lindsey, 1970; Scott and Crossman, 1973
TEMPERATE BASSES																					
white perch	1	1				1			1				1	3	3	1	1				Scott and Crossman, 1973
white bass		1				2			1				1			1	1				Scott and Crossman, 1973
striped bass	2	1							1								1				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
SUNFISHES																					
rock bass	1	1	2			1			1				1			1	2				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
redbreast sunfish	1	2				1			2				1		2	1	3				Jenkins and Burkhead, 1993
green sunfish	1	2				1			1							1	1				Jenkins and Burkhead, 1993
pumpkinseed	1	2				1			3			3	1		2	1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
warmouth	1	1				1			1				1		2	2	1				Jenkins and Burkhead, 1993
orangespotted sunfish	1	2				1			3				1			1	3				Becker, 1983
bluegill	1	2				1			3			3	1		2	1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
longear sunfish	1	2	2			1			1				2		3	1	3				Scott and Crossman, 1973; Becker, 1983
smallmouth bass	1	1				1			1				1			2	1				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
largemouth bass	1	1				1			1				2			1	1				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
white crappie	2	1	1		2	1			1				2			1	1				Jenkins and Burkhead, 1993
black crappie	2	1	1		1	1			2				1			1	2				Scott and Crossman, 1973; Jenkins and Burkhead, 1993
PERCHES																					
eastern sand darter	1					1				1			2	2		1					Facey, 1995
greenside darter	1					1							3			1					Fahy, 1954; Scott and Crossman, 1973; Bunt *et al.*, 1998
rainbow darter	1					1			2				2		2	1					Scott and Crossman, 1973; Smith, 1985
Iowa darter	1					1			2				1		2	1					Scott and Crossman, 1973
fantail darter	1					1			1				2		3	1					Scott and Crossman, 1973; Smith, 1985; Becker, 1983
least darter	1					1							1			1					Dalton, 1990a; Becker, 1983; Johnson and Hatch, 1991
johnny darter	1					1			3				1			1					Scott and Crossman, 1973; Becker, 1983; Smith, 1985
tessellated darter	1					1			3			3	1			1					Goodchild, 1993d; Jenkins and Burkhead, 1993; Smith, 1985
logperch	1					1			3				2		3	1					Scott and Crossman, 1973; Becker, 1983
channel darter	1					1			3				2			1					Scott and Crossman, 1973; Goodchild, 1993e

	Location			Method							Diet										
COMMON NAME	Bo	Pe	Su	Nb	Fi	Gr	So	St	Pu	Am	Ph	Ma	Cr	An	Mo	In	Fi	Pa	Ot	Comments	Reference
blackside darter	2	1	2			1			1				2			1	3				Scott and Crossman, 1973; Jenkins and Burkhead, 1993; Trautman, 1981; Becker, 1983
river darter	1					1			3				1			1					Dalton, 1990b; Becker, 1983
ruffe	1	1				1	1						1	2	2	1			3	Fish eggs	Ogle, 1995
yellow perch	1	1				1			1				1		3	1	1				Scott and Crossman, 1973
sauger		1							1				2			2	1				Scott and Crossman, 1973
walleye		1							1				3			2	1		3	Frogs, mudpuppies, small mammals	Scott and Crossman, 1973
DRUMS																					
freshwater drum	1					1	1						1		2	1	2				Scott and Crossman, 1973
GOBIES																					
round goby	1					1							1	2	1	2	2		3	Fish eggs	Jude *et al.*, 1992; Marsden *et al.*, 1996
tubenose goby	1					1							1			1					Coad *et al.*, 1995

Table 4. Maximum known age, length, and weight.

Length parameters are TL=total length; SL=standard length; FL=fork length.

COMMON NAME	Age	Reference	Length (mm)	Para-meter	Reference	Weight (g)	Reference	Comment
LAMPREYS								
chestnut lamprey	8	Inferred from Scott and Crossman, 1973	345		Smith, 1979			
northern brook lamprey	8	Inferred from Scott and Crossman, 1973	165		Becker, 1983	9.90	Becker, 1983	
silver lamprey	9	Inferred from Scott and Crossman, 1973	356		Smith, 1979			
American brook lamprey	7	Inferred from Jenkins and Burkhead, 1993	203		Scott and Crossman, 1973			
river lamprey			311		Inferred from Scott and Crossman, 1973			
Arctic lamprey	5	Coad *et al.*, 1995	411		Scott and Crossman, 1973			
Vancouver Island lamprey	8	Beamish, 1987	272		Beamish, 1982			
western brook lamprey	7	Inferred from Scott and Crossman, 1973	163		Scott and Crossman, 1973			
Pacific lamprey	7	Scott and Crossman, 1973	682		Scott and Crossman, 1973			
darktail lamprey	5	Inferred from Houston, 1991						
sea lamprey	9	Inferred from Scott and Crossman, 1973	860		Scott and Crossman, 1973			
STURGEONS								
shortnose sturgeon	67	Dadswell, 1984	1430	TL	Dadswell, 1984	24000	Dadswell, 1979	
lake sturgeon	154	Scott and Crossman, 1973	2414		Scott and Crossman, 1973	140614	Scott and Crossman, 1973	
green sturgeon			2300		Houston, 1988a	158000	Houston, 1988a	
Atlantic sturgeon	60	Scott and Crossman, 1973	2669	TL	Scott and Crossman, 1973	159665	Scott and Crossman, 1973	
white sturgeon	100+	Scott and Crossman, 1973	6000		Hart, 1973	630000	Hart, 1973	
GARS								
longnose gar	32	Minns *et al.*, 1993	1370		Trautman, 1981	6400	Trautman, 1981	
spotted gar	18	Parker and McKee, 1984a	1120		Trautman, 1981	2700	Trautman, 1981	
BOWFINS								
bowfin	25	Minns *et al.*, 1993	870		Minns *et al.*, 1993	6800	Scott and Crossman, 1973	
MOONEYES								
goldeye	14	Scott and Crossman, 1973	508		Trautman, 1981	1400	Trautman, 1981	
mooneye	8	Scott and Crossman, 1973	445		Trautman, 1981	1100	Trautman, 1981	
EELS								
American eel	43	Coad *et al.*, 1995	1520		Minns *et al.*, 1993	7500	Coad *et al.*, 1995	
HERRINGS								

COMMON NAME	Age	Reference	Length (mm)	Para-meter	Reference	Weight (g)	Reference	Comment
blueback herring	9	Jenkins and Burkhead, 1993	380	SL	Jenkins and Burkhead, 1993			
alewife	6	Minns *et al.*, 1993	205	SL	Minns *et al.*, 1993	283	Trautman, 1981	
American shad	11	Scott and Crossman, 1973	658	FL	Jenkins and Burkhead, 1993			
gizzard shad	6	Minns *et al.*, 1993	521		Trautman, 1981	1600	Trautman, 1981	
CARPS and MINNOWS								
chiselmouth	6	Scott and Crossman, 1973	225	FL	Scott and Crossman, 1973			
central stoneroller	4	McAllister, 1987a	190		Trautman, 1981			
goldfish	30	Minns *et al.*, 1993	457		Minns *et al.*, 1993			
redside dace	3	Scott and Crossman, 1973	85	SL	Parker *et al.*, 1988b	8.5	Parker *et al.*, 1988b	
lake chub	5	Portt *et al.*, 1988	189	SL	Portt *et al.*, 1988			
spotfin shiner	5	Jenkins and Burkhead, 1993	120		Trautman, 1981			
common carp	20	Portt *et al.*, 1988	800	SL	Portt *et al.*, 1988			
gravel chub	2	Inferred from Becker, 1983	99		Trautman, 1981			
cutlips minnow	4	Jenkins and Burkhead, 1993; Pappantoniou and Dale, 1984	157	TL	Jenkins and Burkhead, 1993			
western silvery minnow			150		Nelson and Paetz, 1992			
brassy minnow	4	Portt *et al.*, 1988	158	SL	Portt *et al.*, 1988			
eastern silvery minnow	3	Jenkins and Burkhead, 1993	120	TL	Scott and Crossman, 1973			
striped shiner	5	Goodchild, 1993a	240	TL	Trautman, 1981			
common shiner	5	Portt *et al.*, 1988	169	SL	Portt *et al.*, 1988			
redfin shiner	2	Matthews and Heins, 1984	81		Trautman, 1981			
silver chub	3	Parker *et al.*, 1987a	231		Trautman, 1981	170	Trautman, 1981	
pearl dace	4	Portt *et al.*, 1988	132	SL	Portt *et al.*, 1988			
peamouth	13	Wydoski and Whitney, 1979	356		Wydoski and Whitney, 1979			
hornyhead chub	4	Minns *et al.*, 1993	188	SL	Minns *et al.*, 1993			
river chub	5	Jenkins and Burkhead, 1993	287	TL	Trautman, 1981	283	Trautman, 1981	
golden shiner	7	Portt *et al.*, 1988	211	SL	Portt *et al.*, 1988			
pugnose shiner	3	Inferred from Becker, 1983	60		Becker, 1983	2.446	Becker, 1983	
emerald shiner	4	Portt *et al.*, 1988	124	SL	Portt *et al.*, 1988			
bridle shiner	2	Jenkins and Burkhead, 1993	50	SL	Jenkins and Burkhead, 1993			
river shiner	4	Etnier and Starnes, 1993; Becker, 1983	132		Trautman, 1981			
ghost shiner	3	Etnier and Starnes, 1993	64		Trautman, 1981			
bigmouth shiner	4	Carlander, 1969	76		Trautman, 1981			

COMMON NAME	Age	Reference	Length (mm)	Parameter	Reference	Weight (g)	Reference	Comment
blackchin shiner	4	Portt *et al.*, 1988	71	SL	Portt *et al.*, 1988			
blacknose shiner	3	Portt *et al.*, 1988	81	SL	Portt *et al.*, 1988			
spottail shiner	4	Portt *et al.*, 1988	137	SL	Portt *et al.*, 1988			
silver shiner	3	Jenkins and Burkhead, 1993	130		Trautman, 1981			
rosyface shiner	3	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	92	TL	Jenkins and Burkhead, 1993			
sand shiner	3	Jenkins and Burkhead, 1993	81		Trautman, 1981	4.74	Becker, 1983	
weed shiner	3	Etnier and Starnes, 1993	87.5		Becker, 1983			
mimic shiner	3	Jenkins and Burkhead, 1993	76		Trautman, 1981			
pugnose minnow	3	Parker *et al.*, 1987b	64		Trautman, 1981			
northern redbelly dace	8	Portt *et al.*, 1988	61	SL	Portt *et al.*, 1988			
finescale dace	8	Portt *et al.*, 1988	80	SL	Portt *et al.*, 1988			
bluntnose minnow	3	Portt *et al.*, 1988	112		Trautman, 1981			
fathead minnow	4	Portt *et al.*, 1988	73	SL	Portt *et al.*, 1988			
flathead chub	10	Nelson and Paetz, 1992	317	TL	Scott and Crossman, 1973			
northern squawfish	19	Wydoski and Whitney, 1979	360		Scott and Crossman, 1973	13000	Scott and Crossman, 1973	
blacknose dace	3	Portt *et al.*, 1988	58	SL	Portt *et al.*, 1988			
longnose dace	5	Portt *et al.*, 1988	118	SL	Portt *et al.*, 1988			
leopard dace	5	Wydoski and Whitney, 1979; Gee and Northcote, 1963	127		Carl *et al.*, 1959			
speckled dace	3	Wydoski and Whitney, 1979	110	TL	Coad *et al.*, 1995			
Umatilla dace								
redside shiner	7	Scott and Crossman, 1973	180		Scott and Crossman, 1973			
rudd	11	Coad *et al.*, 1995	450		Coad *et al.*, 1995	2060	Coad *et al.*, 1995	
creek chub	5	Portt *et al.*, 1988	240	SL	Portt *et al.*, 1988			
fallfish	10	Coad *et al.*, 1995; Reed, 1971	420		Scott and Crossman, 1973	794	Scott and Crossman, 1973	
tench	30	Coad *et al.*, 1995	635		Coad *et al.*, 1995	7000	Coad *et al.*, 1995	
SUCKERS								
quillback	12	Minns *et al.*, 1993	660		Minns *et al.*, 1993			
longnose sucker	24	Portt *et al.*, 1988	583	SL	Portt *et al.*, 1988			
bridgelip sucker	9	Inferred from Dauble, 1980	489	FL	Dauble, 1980			
white sucker	15	Portt *et al.*, 1988	487	SL	Portt *et al.*, 1988			
largescale sucker	15	Scott and Crossman, 1973	610		Scott and Crossman, 1973	3175	Scott and Crossman, 1973	
mountain sucker	9	Scott and Crossman, 1973	226.5	TL	Scott and Crossman, 1973			

COMMON NAME	Age	Reference	Length (mm)	Parameter	Reference	Weight (g)	Reference	Comment
lake chubsucker	8	Scott and Crossman, 1973	292		Trautman, 1981	397	Trautman, 1981	Scott and Crossman, 1973 and Becker (1983) report that they get much larger in the south of their range.
northern hog sucker	10	Jenkins and Burkhead, 1993; Scott and Crossman, 1973	610		Trautman, 1981	2268	Trautman, 1981	
bigmouth buffalo	20	Goodchild, 1990c	696		Goodchild, 1990c	36300	Trautman, 1981	
black buffalo	24	Houston, 1990d	1041		Houston, 1990d	12700	Houston, 1990d	
spotted sucker	6	Scott and Crossman, 1973	449		Trautman, 1981	1400	Trautman, 1981	
silver redhorse	14	Minns *et al.*, 1993	635		Minns *et al.*, 1993			
river redhorse	14	Parker and McKee, 1984c	617	TL	Parker and McKee, 1984c	2814	Parker and McKee, 1984c	
black redhorse	10	Jenkins and Burkhead, 1993	658	TL	Jenkins and Burkhead, 1993	3200	Jenkins and Burkhead, 1993	Missouri
golden redhorse	11	Jenkins and Burkhead, 1993	660		Trautman, 1981	2000	Trautman, 1981	
copper redhorse	21	Coad *et al.*, 1995; Mongeau *et al.*, 1992	681	TL	Mongeau *et al.*, 1992			
shorthead redhorse	14	Minns *et al.*, 1993	620		Minns *et al.*, 1993			
greater redhorse	12	Becker, 1983	673	TL	Becker, 1983	4850	Becker, 1983	Wisconsin
BULLHEAD CATFISHES								
black bullhead	9	Jenkins and Burkhead, 1993; Scott and Crossman, 1973	427		Trautman, 1981	1247	Trautman, 1981	
yellow bullhead	7	Scott and Crossman, 1973	465		Trautman, 1981	1600	Trautman, 1981	
brown bullhead	8	Portt *et al.*, 1988	297	SL	Portt *et al.*, 1988			
channel catfish	24	Minns *et al.*, 1993	1004		Minns *et al.*, 1993			
stonecat	9	Jenkins and Burkhead, 1993; Scott and Crossman, 1973	312		Trautman, 1981	482	Trautman, 1981	
tadpole madtom	3	Portt *et al.*, 1988; Mahon, 1977	110	SL	Portt *et al.*, 1988			
margined madtom	4	Jenkins and Burkhead, 1993	179	TL	Jenkins and Burkhead, 1993			Virginia
brindled madtom	3	Etnier and Starnes, 1993	130		Trautman, 1981			
northern madtom			130		Trautman, 1981			
flathead catfish	24	Becker, 1983	1120		Becker, 1983	24950	Becker, 1983	
PIKES								
redfin pickerel	7	Scott and Crossman, 1973	312	TL	Scott and Crossman, 1973			
grass pickerel	7	Scott and Crossman, 1973	328	TL	Scott and Crossman, 1973	204	Scott and Crossman, 1973	
northern pike	12	Portt *et al.*, 1988	1000	SL	Portt *et al.*, 1988			

COMMON NAME	Age	Reference	Length (mm)	Para-meter	Reference	Weight (g)	Reference	Comment
muskellunge	22	Portt *et al.*, 1988	1426	SL	Portt *et al.*, 1988			
chain pickerel	9	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	991		Jenkins and Burkhead, 1993	5600	Jenkins and Burkhead, 1993	New Jersey
MUDMINNOWS								
Alaska blackfish	8	Scott and Crossman, 1973; McPhail and Lindsey, 1970	205		Scott and Crossman, 1973			
central mudminnow	4	Portt *et al.*, 1988	132	SL	Portt *et al.*, 1988			
SMELTS								
pond smelt	9	Coad *et al.*, 1995; Degraaf, 1986	200		Coad *et al.*, 1995			
surf smelt	4	Coad *et al.*, 1995; Hart, 1973	222		Hart, 1973			
rainbow smelt	6	Portt *et al.*, 1988	297	SL	Portt *et al.*, 1988			
pygmy smelt	5	Coad *et al.*, 1995	135	SL	Coad *et al.*, 1995			
longfin smelt	3	Scott and Crossman, 1973; Wydoski and Whitney, 1979						
eulachon	5	Scott and Crossman, 1973	165	FL	Scott and Crossman, 1973			
TROUTS								
cisco (lake herring)	13	Portt *et al.*, 1988	395	SL	Portt *et al.*, 1988			
Arctic cisco	21	Coad *et al.*, 1995	640		Coad *et al.*, 1995	7000	Coad *et al.*, 1995	
bloater	11	Scott and Crossman, 1973	366	TL	Becker, 1983	332	Becker, 1983	
kiyi	10	Scott and Crossman, 1973; Parker, 1989c	351	TL	Becker, 1983	332	Becker, 1983	
Bering cisco	7	Edge, 1991	480		Coad *et al.*, 1995			
blackfin cisco	11	Scott and Crossman, 1973	510		Coad *et al.*, 1995; Parker, 1989a			
shortnose cisco	8	Scott and Crossman, 1973; Parker, 1988b	356	TL	Scott and Crossman, 1973	539	Scott and Crossman, 1973	
least cisco	26	Scott and Crossman, 1973; Coad *et al.*, 1995	419		Scott and Crossman, 1973			
shortjaw cisco	10	Scott and Crossman, 1973; Becker, 1983	404	TL	Becker, 1983	312	Becker, 1983	
Atlantic whitefish			508		Scott and Crossman, 1973	3630	Coad *et al.*, 1995	
lake whitefish	28	Scott and Crossman, 1973	526	SL	Portt *et al.*, 1988	19000	Scott and Crossman, 1973	
broad whitefish	35	Coad *et al.*, 1995	710		Coad *et al.*, 1995	16000	Coad *et al.*, 1995	
pygmy whitefish	9	Scott and Crossman, 1973; McPhail and Lindsey, 1970; Coad *et al.*, 1995	272	FL	Scott and Crossman, 1973; McPhail and Lindsey, 1970; Coad *et al.*, 1995			
round whitefish	14	Minns *et al.*, 1993	468	SL	Minns *et al.*, 1993			
mountain whitefish	18	Scott and Crossman, 1973	572		Scott and Crossman, 1973; Ford *et al.*, 1995	2013	Scott and Crossman, 1973	
inconnu	22	Coad *et al.*, 1995	1500		Coad *et al.*, 1995	28500	Coad *et al.*, 1995	

COMMON NAME	Age	Reference	Length (mm)	Parameter	Reference	Weight (g)	Reference	Comment
golden trout	7	Coad *et al.*, 1995; Wydoski and Whitney, 1979	711		Wydoski and Whitney, 1979	5103	Wydoski and Whitney, 1979	
cutthroat trout	10	Scott and Crossman, 1973	991		Scott and Crossman, 1973	18600	Scott and Crossman, 1973	
pink salmon	2	Minns *et al.*, 1993	508		Minns *et al.*, 1993			
chum salmon	9	Coad *et al.*, 1995	1020		Coad *et al.*, 1995	20400	Coad *et al.*, 1995	
coho salmon	3	Minns *et al.*, 1993	900	SL	Minns *et al.*, 1993			
rainbow trout	8	Portt *et al.*, 1988	915	SL	Portt *et al.*, 1988			
sockeye salmon	8	Scott and Crossman, 1973	533		Scott and Crossman, 1973; Coad *et al.*, 1995	4270	Coad *et al.*, 1995	
chinook salmon	9	Minns *et al.*, 1993	968		Minns *et al.*, 1993			
Atlantic salmon	11	Scott and Crossman, 1973	1500		Coad *et al.*, 1995	35900	Coad *et al.*, 1995	
brown trout	18	Minns *et al.*, 1993	874		Minns *et al.*, 1993			
Arctic char	40	Scott and Crossman, 1973	1016		Coad *et al.*, 1995	16000	Coad *et al.*, 1995	
bull trout	19	Coad *et al.*, 1995	1030		Coad *et al.*, 1995	18300	Coad *et al.*, 1995	
brook trout	9	Portt *et al.*, 1988	350	SL	Portt *et al.*, 1988			
Aurora trout			600	TL	Parker and Brousseau, 1988.	3500	Parker and Brousseau, 1988.	
Dolly Varden	20	Coad *et al.*, 1995	1280		Coad *et al.*, 1995	14500	Scott and Crossman, 1973	
lake trout	53	Coad *et al.*, 1995	1310	SL	Portt *et al.*, 1988	46300	Scott and Crossman, 1973	
Arctic grayling	12	Scott and Crossman, 1973	757	FL?	Scott and Crossman, 1973	2693	Scott and Crossman, 1973	
TROUT-PERCHES								
trout-perch	4	Portt *et al.*, 1988	123	SL	Portt *et al.*, 1988			
CODS								
burbot	13	Portt *et al.*, 1988	775	SL	Portt *et al.*, 1988			
Atlantic tomcod	6	Coad *et al.*, 1995	421		Coad *et al.*, 1995	570	Coad *et al.*, 1995	
KILLIFISHES								
banded killifish	4	Fritz and Garside, 1975	102	SL	Portt *et al.*, 1988			
mummichog	4	Coad *et al.*, 1995	152		Coad *et al.*, 1995			
blackstripe topminnow	3	Coad *et al.*, 1995	97		Coad *et al.*, 1995			
SILVERSIDES								
brook silverside	1.5	Minns *et al.*, 1993	81	SL	Minns *et al.*, 1993			
STICKLEBACKS								
fourspine stickleback	2	Minns *et al.*, 1993	52	SL	Minns *et al.*, 1993			
brook stickleback	3	Portt *et al.*, 1988	87	SL	Portt *et al.*, 1988			

COMMON NAME	Age	Reference	Length (mm)	Parameter	Reference	Weight (g)	Reference	Comment
threespine stickleback	3	Coad *et al.*, 1995	76		Scott and Crossman, 1973			
blackspotted stickleback	1	Coad *et al.*, 1995	76		Scott and Crossman, 1973; Coad *et al.*, 1995			
ninespine stickleback	3	Portt *et al.*, 1988	68	SL	Portt *et al.*, 1988			
SCULPINS								
coastrange sculpin	8	Wydoski and Whitney, 1979	115		Scott and Crossman, 1973			
prickly sculpin	7	Scott and Crossman, 1973; Coad *et al.*, 1995	192	SL	Scott and Crossman, 1973; Coad *et al.*, 1995			
mottled sculpin	4	Portt *et al.*, 1988	82	SL	Portt *et al.*, 1988			
slimy sculpin	7	Minns *et al.*, 1993	120		Minns *et al.*, 1993			
shorthead sculpin	4	Wydoski and Whitney, 1979	102		Wydoski and Whitney, 1979			
torrent sculpin	6	Wydoski and Whitney, 1979	155	TL	Scott and Crossman, 1973: Wydoski and Whitney, 1979			
spoonhead sculpin	6	Coad *et al.*, 1995	135		Nelson and Paetz, 1992			
fourhorn sculpin	14	Houston, 1990b; Coad *et al.*, 1995	340		Houston, 1990b			
deepwater sculpin	7	Coad *et al.*, 1995	235		Coad *et al.*, 1995			
TEMPERATE BASSES								
white perch	12	Minns *et al.*, 1993	482		Minns *et al.*, 1993			
white bass	8	Minns *et al.*, 1993	322	SL	Minns *et al.*, 1993			
striped bass	31	Jenkins and Burkhead, 1993; Coad *et al.*, 1995	1829		Jenkins and Burkhead, 1993	50800	Jenkins and Burkhead, 1993	California
SUNFISHES								
rock bass	10	Portt *et al.*, 1988	373		Trautman, 1981	900	Trautman, 1981	
redbreast sunfish	8	Houston, 1990c	203		Scott and Crossman, 1973	227	Inferred from Carlander, 1969	
green sunfish	9	Minns *et al.*, 1993	169	SL	Minns *et al.*, 1993	411	Trautman, 1981	
pumpkinseed	9	Portt *et al.*, 1988	219	SL	Portt *et al.*, 1988	312	Trautman, 1981	
warmouth	8	Inferred from Carlander, 1969; Smith, 1985	284		Trautman, 1981	500	Trautman, 1981	Smith, 1985 reports a 964 g angling record from South Carolina.
orangespotted sunfish	7	Noltie, 1990	112		Becker, 1983			Wisconsin
bluegill	9	Portt *et al.*, 1988	250	SL	Portt *et al.*, 1988	808	Trautman, 1981	
longear sunfish	8	Scott and Crossman, 1973	150		Scott and Crossman, 1973	57	Trautman, 1981	
smallmouth bass	12	Portt *et al.*, 1988	423	SL	Portt *et al.*, 1988	3400	Trautman, 1981	
largemouth bass	23	Green and Heidinger, 1994	453	SL	Portt *et al.*, 1988.	4026	Trautman, 1981	

COMMON NAME	Age	Reference	Length (mm)	Para-meter	Reference	Weight (g)	Reference	Comment
white crappie	9	Jenkins and Burkhead, 1993	508		Trautman, 1981	1400	Trautman, 1981	
black crappie	9	Portt *et al.*, 1988	460		Trautman, 1981	1600	Trautman, 1981	
PERCHES								
eastern sand darter	2	Facey, 1995	81		Trautman, 1981			
greenside darter	4	Bunt *et al.*, 1998; Portt, 1979	110		Trautman, 1981			
rainbow darter	3	Becker, 1983	74	TL	Becker, 1983	4.9	Becker, 1983	
Iowa darter	3	Portt *et al.*, 1988	58	SL	Portt *et al.*, 1988			
fantail darter	4	Scott and Crossman, 1973	70	TL	Scott and Crossman, 1973			
least darter	3	Johnson and Hatch, 1991	46	TL	Trautman, 1981			
johnny darter	4	Portt *et al.*, 1988	60	SL	Portt *et al.*, 1988			
tessellated darter	4	Goodchild, 1993d; Jenkins and Burkhead, 1993	88	SL	Goodchild, 1993d; Jenkins and Burkhead, 1993			
logperch	3	Portt *et al.*, 1988	150	SL	Portt *et al.*, 1988			
channel darter	3	Inferred from Etnier and Starnes, 1993	61	TL	Scott and Crossman, 1973			
blackside darter	4	Scott and Crossman, 1973; Becker, 1983	111	TL	Becker, 1983	14.7	Becker, 1983	
river darter	2	Becker, 1983	80		Becker, 1983	4.9	Becker, 1983	
ruffe	11	Ogle, 1995	290		Ogle, 1995			
yellow perch	11	Scott and Crossman, 1973	533		Coad *et al.*, 1995	1914	Scott and Crossman, 1973	
sauger	13	Portt *et al.*, 1988	593	SL	Portt *et al.*, 1988	3970	Becker, 1983	
walleye	20	Portt *et al.*, 1988	641	SL	Portt *et al.*, 1988	10688	Scott and Crossman, 1973	
DRUMS								
freshwater drum	17	Minns *et al.*, 1993	940		Becker, 1983	14100	Becker, 1983	Wisconsin. Specimens over 20 kg reported from Iowa and Tennessee.
GOBIES								
round goby	5	Jude *et al.*, 1992	250	SL	Coad *et al.*, 1995; Jude *et al.*, 1992			
tubenose goby	5	Jude *et al.*, 1992	115		Coad *et al.*, 1995			

Table 5. Reproductive guild following Balon (1975, 1981) and age, length, and weight at the onset of maturity for Canadian fishes. Length parameters are TL=total length; SL=standard length; FL=fork length.

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
LAMPREYS									
chestnut lamprey	A.2.3	6	Scott and Crossman, 1973	101	TL	Scott and Crossman, 1973			
northern brook lamprey	A.2.3	6	Scott and Crossman, 1973	135		Scott and Crossman, 1973			
silver lamprey	A.2.3	6	Scott and Crossman, 1973	100		Scott and Crossman, 1973	1.5	Scott and Crossman, 1973	
American brook lamprey	A.2.3	5	Jenkins and Burkhead, 1993; Scott and Crossman, 1973	150		Scott and Crossman, 1973			
river lamprey	A.2.3			162		Inferred from Scott and Crossman, 1973			
Arctic lamprey	A.2.3	4	Coad *et al.*, 1995; Inferred from Scott and Crossman, 1973	180		Scott and Crossman, 1973			
Vancouver Island lamprey	A.2.3	6	Beamish, 1987						Age of transformation
western brook lamprey	A.2.3	6	Scott and Crossman, 1973	165		Scott and Crossman, 1973			
Pacific lamprey	A.2.3	5	Beamish and Levings, 1991	537		Inferred from Scott and Crossman, 1973			
darktail lamprey	A.2.3	4	Houston, 1991	180		Houston, 1991			
sea lamprey	A.2.3	7	Scott and Crossman, 1973; Beamish, 1980a	140		Scott and Crossman, 1973			
STURGEONS									
shortnose sturgeon	A.1.2	18	Dadswell, 1979	550	FL	Dadswell, 1984			Females
lake sturgeon	A.1.2	20	Scott and Crossman, 1973	950	TL	Scott and Crossman, 1973	6645	Scott and Crossman, 1973	
green sturgeon	A.1.2	24	Assumed in Houston, 1988a						
Atlantic sturgeon	A.1.5	27	Scott and Crossman, 1973	1900	TL	Scott and Crossman, 1973			
white sturgeon	A.1.2	22	Hart, 1973	1400		Inferred from Scott and Crossman, 1973 and Hart, 1973	13600	Inferred from Scott and Crossman, 1973 and Hart, 1973	Fraser River females. Lower age in US populations.
GARS									
longnose gar	A.1.5	6	Minns *et al.*, 1993	500		Minns *et al.*, 1993			
spotted gar	A.1.5	4	Parker and McKee, 1984a	549		Inferred from Parker and McKee, 1984a			Females mature at age 3 or 4 in Missouri.
BOWFINS									
bowfin	B.2.5	4	Minns *et al.*, 1993	610		Minns *et al.*, 1993			

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Parameter	Length reference	Weight (g)	Weight reference	Comments
MOONEYES									
goldeye	A.1.2	7	Inferred from Scott and Crossman, 1973	320	FL	Inferred from Scott and Crossman, 1973	388	Inferred from Scott and Crossman, 1973	Age of maturity is higher as one moves north, so the median age was estimated given the data provided in Scott and Crossman, 1973. Length and weight at age 7 was averaged across all localities.
mooneye	A.1.2	5	Scott and Crossman, 1973	320	TL	Inferred from Scott and Crossman, 1973	318	Inferred from Scott and Crossman, 1973	
EELS									
American eel	A.1.1	13	Coad *et al.*, 1995	460	TL	Coad *et al.*, 1995			
HERRINGS									
blueback herring	A.1.4	4	Dadswell, 1985	195		Dadswell, 1985			
alewife	A.1.4	3	Minns *et al.*, 1993	138	SL	Minns *et al.*, 1993			
American shad	A.1.1	5	Scott and Crossman, 1973	470		Inferred from Scott and Crossman, 1973			Usual age for commencement of spawning
gizzard shad	A.1.2	2	Minns *et al.*, 1993	279	SL	Minns *et al.*, 1993			
CARPS and MINNOWS									
chiselmouth	A.1.3	4	Scott and Crossman, 1973						
central stoneroller	A.2.3	2	McAllister, 1987a	70		McAllister, 1987a			
goldfish	A.1.5	4	Minns *et al.*, 1993	175		Minns *et al.*, 1993			
redside dace	A.1.3	2	McKee and Parker, 1982	69.1		Scott and Crossman, 1973			
lake chub	A.1.3	3	Portt *et al.*, 1988	108	SL	Portt *et al.*, 1988			
spotfin shiner	A.1.4	2	Jenkins and Burkhead, 1993; Carlander, 1969	65	TL	Jenkins and Burkhead, 1993; Carlander, 1969			Range of age at maturity was 1-3 over 3 different studies (New York, Ohio, Iowa). Length is approximate for age 2 fish.
common carp	A.1.5	4	Portt *et al.*, 1988	353	SL	Portt *et al.*, 1988			
gravel chub	A.1.4	1	Inferred from Becker, 1983 and from Jenkins and Burkhead, 1993 for streamline chub	81		Becker, 1983			Length of breeding adults
cutlips minnow	B.2.3	2	Inferred from Jenkins and Burkhead, 1993	80		Inferred from Jenkins and Burkhead, 1993 and Pappantoniou and Dale, 1984			Jenkins and Burkhead, 1993 states "yearlings and some age 2 are immature"; Length is estimate based on data in references
western silvery minnow	A.1.4								
brassy minnow	A.1.4	1	Portt *et al.*, 1988	57	SL	Portt *et al.*, 1988			Becker, 1983 states age 2 is when most fish are mature

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
eastern silvery minnow	A.1.4	2	Jenkins and Burkhead, 1993	87	TL	Inferred from Jenkins and Burkhead, 1993			Length is for an age 2 fish
striped shiner	B.2.3	2	Jenkins and Burkhead, 1993	67	SL	Jenkins and Burkhead, 1993			Balon guild assumed same as common shiner based on accounts in Smith, 1979 and Jenkins and Burkhead, 1993; Length is for females
common shiner	B.2.3	1	Portt *et al.*, 1988	74	SL	Portt *et al.*, 1988			
redfin shiner	A.1.4	1	Matthews and Heins, 1984	30	SL	Inferred from Matthews and Heins, 1984			Mississippi study
silver chub	A.1.4	2	Parker *et al.*, 1987a	132	SL	Inferred from Scott and Crossman, 1973			Median length at age 2.
pearl dace	A.1.3	2	Portt *et al.*, 1988	94	SL	Portt *et al.*, 1988			
peamouth	A.1.3	4	Wydoski and Whitney, 1979	249	TL	Inferred from Wydoski and Whitney, 1979			In general, females mature at age 4, males at age 3; Length is for age 4 females.
hornyhead chub	A.2.3	3	Minns *et al.*, 1993	93	SL	Minns *et al.*, 1993			
river chub	A.2.3	3	Jenkins and Burkhead, 1993	110	SL	Scott and Crossman, 1973			Females mature at age 3, some males at age 2; Median length at age 3 in Ontario.
golden shiner	A.1.5	2	Portt *et al.*, 1988	64	SL	Portt *et al.*, 1988	17	Keast and Eadie, 1984	Weight at first spawning.
pugnose shiner	A.1.3								
emerald shiner	A.1.1	1	Portt *et al.*, 1988	42	SL	Portt *et al.*, 1988			
bridle shiner	A.1.5	1	Jenkins and Burkhead, 1993	35	SL	Inferred from Jenkins and Burkhead, 1993 and Harrington, 1947			
river shiner	A.1.3	2	Etnier and Starnes, 1993; Trautman, 1981	69	SL	Inferred from Carlander, 1969			Age is for females in Etnier and Starnes, 1993, and is also estimated from Trautman, 1981; Median length at age 2 for Lake of the Woods fish.
ghost shiner	?	2	Becker, 1983	43		Inferred from Trautman, 1981			
bigmouth shiner	A.1.3	2	Becker, 1983	48	TL	Inferred from Carlander, 1969			Length at age 2 from Des Moines R, Iowa.
blackchin shiner	A.1.5	1	Portt *et al.*, 1988	37	SL	Portt *et al.*, 1988	1.1	Keast and Eadie, 1984	Weight at first spawning.
blacknose shiner	A.1.6	1	Portt *et al.*, 1988	24	SL	Portt *et al.*, 1988			
spottail shiner	A.1.6	1	Portt *et al.*, 1988	55	SL	Portt *et al.*, 1988			
silver shiner	A.1.1	1	McKee and Parker, 1982	57	SL	McKee and Parker, 1982			Balon guild assumed same as emerald shiner based on account in Jenkins and Burkhead, 1993.

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
rosyface shiner	A.1.3	1	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	50	SL	Inferred from Carlander, 1969			Mature at age 1, or maybe age 2; Median length at age 1 in New York.
sand shiner	A.1.6	1	Jenkins and Burkhead, 1993; Scott and Crossman, 1973; Becker, 1983	29	SL	Jenkins and Burkhead, 1993			
weed shiner	?	1	Etnier and Starnes, 1993	42	TL	Inferred from Becker, 1983			Median length at age 1.
mimic shiner	A.1.4	1	Portt *et al.*, 1988	35	SL	Portt *et al.*, 1988			
pugnose minnow	A.1.5								
northern redbelly dace	A.1.5	1	Portt *et al.*, 1988	46	SL	Portt *et al.*, 1988			
finescale dace	A.1.4	2	Portt *et al.*, 1988	59	SL	Portt *et al.*, 1988			
bluntnose minnow	B.2.7	1	Portt *et al.*, 1988	50	SL	Portt *et al.*, 1988	1.3	Keast and Eadie, 1984	Weight at first spawning.
fathead minnow	B.2.7	1	Portt *et al.*, 1988	54	SL	Portt *et al.*, 1988			
flathead chub	A.1.3	4	Nelson and Paetz, 1992	180		Nelson and Paetz, 1992			
northern squawfish	A.1.3	6	Scott and Crossman, 1973	305		Scott and Crossman, 1973			
blacknose dace	A.1.3	2	Portt *et al.*, 1988	49	SL	Portt *et al.*, 1988			
longnose dace	A.1.3	2	Portt *et al.*, 1988	74	SL	Portt *et al.*, 1988			
leopard dace	A.1.3	3	Gee and Northcote, 1963	70	FL	Gee and Northcote, 1963			
speckled dace	A.1.3	2	Peden and Hughes, 1984a	45		Peden and Hughes, 1984a			
Umatilla dace	A.1.3								
redside shiner	A.1.4	3	Scott and Crossman, 1973	69		Wydoski and Whitney, 1979.			Length at age 3.
rudd	A.1.5	2	Coad *et al.*, 1995						
creek chub	A.2.3	2	Portt *et al.*, 1988	87	SL	Portt *et al.*, 1988			
fallfish	A.2.3	4	Reed, 1971	166	TL	Reed, 1971			Age 4 for females and age 3 for males in Massachusetts; Mean length at age 4 from four Massachusetts populations.
tench	A.1.5	4	Coad *et al.*, 1995	120		Coad *et al.*, 1995			Females
SUCKERS									
quillback	A.1.6	6	Minns *et al.*, 1993	472	SL	Minns *et al.*, 1993			
longnose sucker	A.1.3	6	Portt *et al.*, 1988	240	SL	Portt *et al.*, 1988			
bridgelip sucker	A.1.3	6	Dauble, 1980	378	FL	Dauble, 1980			
white sucker	A.1.3	4	Portt *et al.*, 1988	253	SL	Portt *et al.*, 1988			
largescale sucker	A.1.6	5	Wydoski and Whitney, 1979	190	FL	Scott and Crossman, 1973			Age from British Columbia population; Length at age 5 in Okanagan Lake.
mountain sucker	A.1.3	4	Scott and Crossman, 1973; Wydoski and Whitney, 1979;	136	TL	Inferred from Hauser, 1969.			

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
			Hauser, 1969						
lake chubsucker	A.1.5	3	Becker, 1983	208		Becker, 1983			Length at age 3
northern hog sucker	A.1.3	3	Jenkins and Burkhead, 1993	133	TL	Scott and Crossman, 1973			Most females mature by age 3; Median length at age 3 in New York.
bigmouth buffalo	A.1.5	4		400		See comments.			Our estimate for age and length in Ontario, but is likely higher in Prairie provinces. Becker (1983) gives age 3 in South Dakota, but a 400mm fish in Wisconsin would be about age 4. Age at maturity appears to vary from 1 to 10 (Goodchild, 1990c; Becker, 1983), however, size at maturity appears more consistent over its range, as inferred from Scott and Crossman, 1973, Goodchild, 1990c; Becker, 1983, Etnier and Starnes, 1993; Trautman, 1981. The size range at maturity appears broad in Johnson, 1963
black buffalo	A.1.5	3	Houston, 1990d	308		Houston, 1990d	1250	Houston, 1990d	
spotted sucker	A.1.3	3	Etnier and Starnes, 1993	270	TL	Becker, 1983			Age from Oklahoma population; Calculated length at age 3
silver redhorse	A.1.3	5	Minns *et al.*, 1993	391		Minns *et al.*, 1993			
river redhorse	A.1.3	5	Inferred from Jenkins and Burkhead, 1993	335	TL	Jenkins and Burkhead, 1993			Length is median of mean lengths for age 5 from various localities
black redhorse	A.1.3	3	Jenkins and Burkhead, 1993	230		Becker, 1983			Length at age 3 in Wisconsin.
golden redhorse	A.1.3	4	Goodchild, 1990d; Jenkins and Burkhead, 1993	259		Becker, 1983			Length at age 4 in central Wisconsin. Goodchild, 1990d provides similar (272mm) size at age 4 in a Missouri population.
copper redhorse	A.1.3	10	Coad *et al.*, 1995	698		Scott and Crossman, 1973			
shorthead redhorse	A.1.3	3	Minns *et al.*, 1993	195		Minns *et al.*, 1993			
greater redhorse	A.1.3	5	Becker, 1983	460	SL	Becker, 1983			Age 5 or 6 for males.
BULLHEAD CATFISHES									
black bullhead	B.2.3	3	Jenkins and Burkhead, 1993	220	TL	Scott and Crossman, 1973			Mature at age 2 or 3; Length is approximate median at age 3.
yellow bullhead	B.2.7	2	Jenkins and Burkhead, 1993	212	TL	Scott and Crossman, 1973			Age of females; Length is approximate median at age 2.
brown bullhead	B.2.7	3	Portt *et al.*, 1988	161	SL	Portt *et al.*, 1988			

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
channel catfish	B.2.7	7	Minns *et al.*, 1993	337		Minns *et al.*, 1993			
stonecat	B.2.7	3	Jenkins and Burkhead, 1993	89	SL	Scott and Crossman, 1973			Stated as age 3 or 4; Calculated SL at age 3.
tadpole madtom	B.2.7	2	Mahon, 1977	62	SL	Portt *et al.*, 1988			10% of age 1 and 78% of age 2 females were mature.
margined madtom	B.2.7	2	Jenkins and Burkhead, 1993	103	TL	Carlander, 1969			Length at age 2 during August.
brindled madtom	B.2.7	2	Etnier and Starnes, 1993	61		Scott and Crossman, 1973			May be mature at age 1, but varies with area.
northern madtom	B.2.7	2	Inferred from Trautman, 1981	60		Inferred from Trautman, 1981			Length provided is approximate.
flathead catfish	B.2.3	5	Goodchild, 1993b	485	TL	Goodchild, 1993b			Females
PIKES									
redfin pickerel	A.1.5	3	Jenkins and Burkhead, 1993	172	FL	Scott and Crossman, 1973			Age 2 or 3, but fish generally mature older in the north, and they will likely be similar in age to the grass pickerel; Median length at age 3.
grass pickerel	A.1.5	3	Scott and Crossman, 1973	164	FL	Scott and Crossman, 1973			Age 2 or 3, but the minimum size at maturity provided for females appears to be near the upper end of the age 2 size range, therefore we infer that most will not be mature until age 3; Median length at age 3.
northern pike	A.1.5	3	Portt *et al.*, 1988	534	SL	Portt *et al.*, 1988			
muskellunge	A.1.5	4	Portt *et al.*, 1988	650	SL	Portt *et al.*, 1988			
chain pickerel	A.1.5	4	Scott and Crossman, 1973; Jenkins and Burkhead, 1993	440	TL	Scott and Crossman, 1973			Age 1-4 given for maturity, with fish maturing older in the north; Median length at age 4 in New Brunswick.
MUDMINNOWS									
Alaska blackfish	A.1.5	3	Scott and Crossman, 1973; McPhail and Lindsey, 1970	50		McPhail and Lindsey, 1970			
central mudminnow	A.1.5	1	Portt *et al.*, 1988	110	SL	Portt *et al.*, 1988			Age 1 may be typical for southern Ontario, however, females are mature at age 2 in Manitoba according to Martin-Bergmann and Gee, 1985.
SMELTS									
pond smelt	A.1.4	3	Coad *et al.*, 1995	75		McPhail and Lindsey, 1970			Degraaf, 1986 states that some mature at age 4 but all are mature at age 5 in a Yukon population.
surf smelt	A.1.3	2	Inferred from Coad *et al.*, 1995						Some fish mature at age 1, so we infer that most will mature at age 2.

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Parameter	Length reference	Weight (g)	Weight reference	Comments
rainbow smelt	A.1.3	3	Portt *et al.*, 1988	125	SL	Portt *et al.*, 1988			
pygmy smelt	A.1.3	2	Coad *et al.*, 1995						
longfin smelt	A.1.3	2	Wydoski and Whitney, 1979	107	SL	Wydoski and Whitney, 1979			All fish may die after spawning. The age 3 given for maximum age may represent fish that spawned for the first time at age 3.
eulachon	A.1.6	3	Scott and Crossman, 1973; Barraclough, 1964	124	FL	Scott and Crossman, 1973; Barraclough, 1964			
TROUTS									
cisco (lake herring)	A.1.2	3	Portt *et al.*, 1988	246	SL	Portt *et al.*, 1988			
Arctic cisco	A.1.3	7	Coad *et al.*, 1995						
bloater	A.1.2	3	Coad *et al.*, 1995	208	FL	Scott and Crossman, 1973	88	Scott and Crossman, 1973	Length and weight at age 3 from Lake Ontario.
kiyi	A.1.2	3	Parker, 1989c	173	TL	Becker, 1983			Mature at age 2 or 3; Length for females.
Bering cisco	A.1.3	4	Edge, 1991; Alt, 1973	345	FL	Alt, 1973			Median length at age 4 from Hess Creek, Alaska.
blackfin cisco	A.1.1	4	Scott and Crossman, 1973	183	SL	Scott and Crossman, 1973			Length at age 4.
shortnose cisco	A.1.1								Unknown (Parker, 1988b).
least cisco	A.1.3	7	Coad *et al.*, 1995						Age at maturity ranges 6-9 in normal fish, but in Trout Lake, Yukon, dwarfs mature at age 3-6.
shortjaw cisco	A.1.1	5	Houston, 1988b	277	TL	Scott and Crossman, 1973	125	Scott and Crossman, 1973	Length and weight at age 5 in Lake Superior.
Atlantic whitefish	A.1.3								
lake whitefish	A.1.3	4	Portt *et al.*, 1988	236	SL	Portt *et al.*, 1988			
broad whitefish	A.1.3	7	Scott and Crossman, 1973; Coad *et al.*, 1995						
pygmy whitefish	A.1.3	3	Eschmeyer and Bailey, 1954; McPhail and Lindsey, 1970; Coad *et al.*, 1995	110	TL	Eschmeyer and Bailey, 1954			Females
round whitefish	A.1.3	3	Minns *et al.*, 1993	183		Minns *et al.*, 1993			
mountain whitefish	A.1.3	3	Ford *et al.*, 1995; Wydoski and Whitney, 1979	230		Ford *et al.*, 1995			Median length at age 3.
inconnu	A.2.3	8	Coad *et al.*, 1995; McPhail and Lindsey, 1970	610	SL	Scott and Crossman, 1973	3234	Scott and Crossman, 1973	Length and weight at age 8 from Great Slave Lake.
golden trout	A.2.3	4	Wydoski and Whitney, 1979; Coad *et al.*, 1995	335	TL	Wydoski and Whitney, 1979			Montana lakes

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
cutthroat trout	A.2.3	3	Scott and Crossman, 1973	363	FL	Scott and Crossman, 1973			Length at age 3 on Vancouver Island.
pink salmon	A.2.3	2	Minns *et al.*, 1993	411		Minns *et al.*, 1993			
chum salmon	A.2.3	3	Coad *et al.*, 1995	681	FL	Scott and Crossman, 1973			Length at age 3 in the Fraser River.
coho salmon	A.2.3	3	Minns *et al.*, 1993	635		Minns *et al.*, 1993			
rainbow trout	A.2.3	4	Portt *et al.*, 1988	349	SL	Portt *et al.*, 1988			
sockeye salmon	A.2.3	4	Scott and Crossman, 1973	342		Scott and Crossman, 1973			
chinook salmon	A.2.3	3	Minns *et al.*, 1993	750		Minns *et al.*, 1993			
Atlantic salmon	A.2.3	3	Minns *et al.*, 1993	800		Minns *et al.*, 1993			Age of spawning varies greatly from place to place (Scott and Crossman, 1973).
brown trout	A.2.3	3	Minns *et al.*, 1993	258		Minns *et al.*, 1993			
Arctic char	A.2.3	10	Coad *et al.*, 1995	363	FL	Scott and Crossman, 1973			Age at maturity varies greatly between populations, with extremes from age 1 to age 25 among populations; Length at age 10 for a Frobisher Bay population.
bull trout	A.2.3	5	Coad *et al.*, 1995; Ford *et al.*, 1995	385		Ford *et al.*, 1995			Median length at age 5 from 3 localities in British Columbia.
brook trout	A.2.3	3	Portt *et al.*, 1988	156	SL	Portt *et al.*, 1988			
Aurora trout	A.2.3	3	Parker and Brousseau, 1988.						
Dolly Varden	A.2.3	4	Scott and Crossman, 1973; Coad *et al.*, 1995	206	FL	Scott and Crossman, 1973	73	Scott and Crossman, 1973	Length and weight at age 4 in Eva Creek, Alaska.
lake trout	A.2.3	5	Portt *et al.*, 1988	510	SL	Portt *et al.*, 1988			
Arctic grayling	A.1.3	7	Scott and Crossman, 1973	326	FL	Scott and Crossman, 1973			Range of 4-9 years; Length at age 7 in Prairie Creek, Alberta.
TROUT-PERCHES									
trout-perch	A.1.3	2	Portt *et al.*, 1988	78	SL	Portt *et al.*, 1988			
CODS									
burbot	A.1.2	3	Portt *et al.*, 1988	370	SL	Portt *et al.*, 1988			
Atlantic tomcod	A.1.4	1	Coad *et al.*, 1995; Smith, 1985						
KILLIFISHES									
banded killifish	A.1.5	2	Portt *et al.*, 1988; Keast and Eadie, 1984	53	SL	Portt *et al.*, 1988	2.1	Keast and Eadie, 1984	Weight at first spawning.
mummichog	A.1.4	2	Coad *et al.*, 1995	38		Coad *et al.*, 1995			
blackstripe topminnow	A.1.5	1	Becker, 1983	48	TL	Becker, 1983			Females
SILVERSIDES									
brook silverside	A.1.4	1	Minns *et al.*, 1993; Keast and	74		Minns *et al.*, 1993	0.7	Keast and Eadie, 1984	Weight at first spawning.

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Para-meter	Length reference	Weight (g)	Weight reference	Comments
			Eadie, 1984						
STICKLEBACKS									
fourspine stickleback	B.2.4	2	Minns *et al.*, 1993	41	SL	Minns *et al.*, 1993			
brook stickleback	B.2.4	1	Portt *et al.*, 1988	50	SL	Portt *et al.*, 1988			
threespine stickleback	B.2.4	1	Coad *et al.*, 1995	37	TL	Scott and Crossman, 1973			Median length at age 1.
blackspotted stickleback	B.2.4	1	Inferred from Coad *et al.*, 1995						
ninespine stickleback	B.2.4	2	Portt *et al.*, 1988	35	SL	Portt *et al.*, 1988			
SCULPINS									
coastrange sculpin	B.2.7	3	Wydoski and Whitney, 1979	66	TL	Wydoski and Whitney, 1979			Length at age 3.
prickly sculpin	B.2.7	3	Inferred from Wydoski and Whitney, 1979; Coad *et al.*, 1995	71	SL	Wydoski and Whitney, 1979			Length at age 3 in Oregon.
mottled sculpin	B.2.7	2	Portt *et al.*, 1988	60	SL	Portt *et al.*, 1988			
slimy sculpin	B.2.7	3	Minns *et al.*, 1993	63		Minns *et al.*, 1993			
shorthead sculpin	B.2.7	3	Peden and Hughes, 1984b	65		Peden and Hughes, 1984b			Age for females; Median length at age 3.
torrent sculpin	B.2.7	2	Wydoski and Whitney, 1979	53	SL	Wydoski and Whitney, 1979			Length at age 2.
spoonhead sculpin	B.2.7			68		Becker, 1983	3.14	Becker, 1983	Length of smallest fish with eggs, of two fish discussed from an unspecified sample size.
fourhorn sculpin	B.2.3	4	Houston, 1990b	180	TL	Houston, 1990b			Age 4 or 5; Length for females.
deepwater sculpin	B.2.3	3	Parker, 1988a	85	TL	Parker, 1988a			Females
TEMPERATE BASSES									
white perch	A.1.4	2	Minns *et al.*, 1993	254		Minns *et al.*, 1993			
white bass	A.1.4	3	Minns *et al.*, 1993	115	SL	Minns *et al.*, 1993			
striped bass	A.1.2	5	Coad *et al.*, 1995; Jenkins and Burkhead, 1993	422	FL	Scott and Crossman, 1973			Length at age 5 in St. Lawrence River.
SUNFISHES									
rock bass	B.2.3	2	Portt *et al.*, 1988	54	SL	Portt *et al.*, 1988			
redbreast sunfish	B.2.3	2	Houston, 1990c; Jenkins and Burkhead, 1993				23	Houston, 1990c	
green sunfish	B.2.3	2	Minns *et al.*, 1993	76		Minns *et al.*, 1993			
pumpkinseed	B.2.2	2	Portt *et al.*, 1988	59	SL	Portt *et al.*, 1988			
warmouth	B.2.5	2	Carlander, 1969	89		Carlander, 1969			Size is more important than age for determination of sexual maturity
orangespotted sunfish	B.2.3	2	Becker, 1983; Noltie, 1990	55	TL	Noltie, 1990			Lower limit for length (small sample size of 8), which is similar to the

COMMON NAME	Balon guild	Age	Age reference	Length (mm)	Parameter	Length reference	Weight (g)	Weight reference	Comments
									smaller age 2 fish in Becker, 1983.
bluegill	B.2.3	3	Portt *et al.*, 1988	93	SL	Portt *et al.*, 1988			
longear sunfish	B.2.3	3	Scott and Crossman, 1973	99	TL	Scott and Crossman, 1973			Mean length at age 3+ in Michigan.
smallmouth bass	B.2.3	4	Portt *et al.*, 1988	264	SL	Portt *et al.*, 1988			
largemouth bass	B.2.5	3	Portt *et al.*, 1988	272	SL	Portt *et al.*, 1988			
white crappie	B.1.4	3	Scott and Crossman, 1973	177	TL	Scott and Crossman, 1973			
black crappie	B.2.5	3	Portt *et al.*, 1988	192	SL	Portt *et al.*, 1988			
PERCHES									
eastern sand darter	A.1.6	1	Holm and Mandrak, 1995	36	SL	Holm and Mandrak, 1995			Spawn at age 1 provided they attain 36 mm SL.
greenside darter	A.1.5	1	Bunt *et al.*, 1998; Portt, 1979	56	TL	Bunt *et al.*, 1998; agrees with SL in Fahy, 1954			
rainbow darter	A.2.3	1	Inferred from Becker, 1983	43	TL	Becker, 1983			Median length at age 1.
Iowa darter	A.1.4	1	Portt *et al.*, 1988	43	SL	Portt *et al.*, 1988			
fantail darter	B.2.7	2	Jenkins and Burkhead, 1993	55	TL	Jenkins and Burkhead, 1993			Some mature at age 1; Median length at age 2 for areas west and north of Virginia.
least darter	A.1.5	1	Dalton, 1990a; Johnson and Hatch, 1991	32	TL	Johnson and Hatch, 1991			Median length of 20 females.
johnny darter	B.2.7	1	Portt *et al.*, 1988	37	SL	Portt *et al.*, 1988			
tessellated darter	B.2.7	1	Goodchild, 1993d; Jenkins and Burkhead, 1993	40	TL	Goodchild, 1993d			
logperch	A.1.6	2	Portt *et al.*, 1988	106	SL	Portt *et al.*, 1988			
channel darter	A.2.3	1	Jenkins and Burkhead, 1993	35	SL	Jenkins and Burkhead, 1993			Females
blackside darter	A.2.3	2	Becker, 1983	70	TL	Becker, 1983			Median length at age 2.
river darter	A.2.3	1	Becker, 1983	50		Becker, 1983			Length at age 1
ruffe	A.1.4	2	Coad *et al.*, 1995; Ogle, 1995	115	TL	Ogle, 1995			Can mature as young as 1 or as old as 3 in Eurasian populations.
yellow perch	A.1.4	4	Portt *et al.*, 1988	175	SL	Portt *et al.*, 1988			
sauger	A.1.3	4	Portt *et al.*, 1988	283	SL	Portt *et al.*, 1988	113	Scott and Crossman, 1973	Weight at age 4 in Lake Nipigon
walleye	A.1.2	4	Portt *et al.*, 1988	328	SL	Portt *et al.*, 1988	1247	Scott and Crossman, 1973	Weight at age 4 in Bay of Quinte
DRUMS									
freshwater drum	A.1.1	5	Minns *et al.*, 1993	292		Minns *et al.*, 1993	388	Scott and Crossman, 1973	Weight at age 5 in Lake Erie.
GOBIES									
round goby	B.1.3	1	Coad *et al.*, 1995						Age 1 or 2 stated in Jude *et al.*, 1992.

[illegible]	Belon [illegible]	Age	[illegible]	Length	[illegible]	Length reference [illegible]	Weight (g)	Weight reference	Comments
tubenose goby	B.2.7	1	Coad *et al.*, 1995						Age 1 or 2 stated in Jude *et al.*, 1992.

Table 6. Length-weight regressions.

COMMON NAME	N	a	b	r	Length range	Para-meter	Units	Weight range	Units	Trans-form-ation	Comments	Reference
LAMPREYS												
chestnut lamprey												
northern brook lamprey												
silver lamprey												
American brook lamprey												
river lamprey		-5.8416	2.978	0.992	10-27	TL	cm		g	log	British Columbia	Beamish, 1980b
Arctic lamprey												
Vancouver Island lamprey												
western brook lamprey												
Pacific lamprey												
darktail lamprey												
sea lamprey	25	0.0008	3.2		31.5-93	TL	cm		g		UK source	Fishbase
STURGEONS												
shortnose sturgeon	2890	-5.45	3.21	0.99	15-122	FL	cm		kg	log	St John River estuary	Dadswell, 1979
lake sturgeon	981	-6.156	3.304		180-1778	TL	mm	27-31751	g	log	Lake Winnebago, Wisconsin	Carlander, 1969
green sturgeon												
Atlantic sturgeon		-5.943	3.180			TL	mm		g	log	St. Lawrence River	Carlander, 1969
white sturgeon												
GARS												
longnose gar		-6.811	3.449		>200	TL	mm		g	log	Standard equation derived from 32 populations	Bister *et al.*, 2000
spotted gar		-6.551	3.431		>250	TL	mm		g	log	Standard equation derived from 47 populations	Bister *et al.*, 2000
BOWFINS												
bowfin		-4.961	2.992				mm		g	log		Scott and Crossman, 1973
MOONEYES												
goldeye	1156	-4.638	2.844				mm		g	log	Red Lake, Minnesota	Carlander, 1969
mooneye	550	-.563	3.27		76-152	TL	mm		g	log	Alabama	Carlander, 1969
EELS												
American eel	144	-6.94	3.47	0.955	127-610	TL	mm		g	log	Alabama	Carlander, 1969

COMMON NAME	N	a	b	r^2	Length range	Parameter	Units	Weight range	Units	Transformation	Comments	Reference
HERRINGS												
blueback herring												
alewife	616	-3.770	2.51			SL	mm		g	log	Immatures and adults of both sexes combined. Seneca Lake, New York	Carlander, 1969
American shad		-2.187	2.959	0.88		TL	mm		g	log	Males in Maryland	Fishbase
gizzard shad		-5.376	3.170		>180	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
CARPS and MINNOWS												
chiselmouth												
central stoneroller	89	-3.72	2.39		50-155	TL	mm		g	log	Illinois	Carlander, 1969
goldfish	251236	-4.53	2.90		15-406	TL	mm		g	log	Alabama	Carlander, 1969
redside dace												
lake chub												
spotfin shiner												
common carp		-4.639	2.920		>200	TL	mm		g	log	Standard equation derived from 167 populations	Bister *et al.*, 2000
gravel chub												
cutlips minnow	150	-4.81	3.09		28-126	TL	mm		g	log	Lehigh River, Pennsylvania. Length range estimated from size frequency histogram.	Pappantoniou and Dale, 1984
western silvery minnow												
brassy minnow												
eastern silvery minnow												
striped shiner												
common shiner	201	-4.82	3.05	0.99	26-63	SL	mm		g	log	Southern Ontario	Portt, 1979
redfin shiner												
silver chub		-4.876	3.062			SL	mm		g	log		Carlander, 1969
pearl dace												
peamouth												
hornyhead chub												
river chub												
golden shiner		-5.593	3.302		>50	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
pugnose shiner	100	-4.75	3.53	0.99		SL	mm		g	log	Females from Long Point, Ontario	Mahon, 1976
emerald shiner	13623	-4.71	2.73		51-102	TL	mm		g	log	Alabama	Carlander, 1969
bridle shiner												
river shiner												

COMMON NAME	N	a	b	r	Length range	Para-meter	Units	Weight range	Units	Trans-form-ation	Comments	Reference
ghost shiner												
bigmouth shiner												
blackchin shiner	69	-4.75	2.75	0.96	26-53		mm		g	log	Lake Opinicon	Keast and Eadie, 1984
blacknose shiner	144	-5.00	3.69	0.98		SL	mm		g	log	Females from Long Point, Ontario	Mahon, 1976
spottail shiner		-2.044	2.989			TL	mm		g	log		Carlander, 1969
silver shiner												
rosyface shiner	210	-4.72	2.92	0.98	36-62	SL	mm		g	log	Southern Ontario	Portt, 1979
sand shiner												
weed shiner												
mimic shiner												
pugnose minnow												
northern redbelly dace												
finescale dace												
bluntnose minnow	89	-5.22	3.32	0.97	30-45	SL	mm		g	log	Southern Ontario	Portt, 1979
fathead minnow	50	-4.60	3.09	0.95	35-55	SL	mm		g	log	Females from southern Ontario	Portt, 1979
flathead chub												
northern squawfish		-4.886	2.986			FL	mm		g	log	Equation derived from a number of populations in the lower Columbia and Snake Rivers.	Parker *et al.*, 1995
blacknose dace	314	-4.77	3.09	0.99	23-62	SL	mm		g	log	Southern Ontario	Portt, 1979
longnose dace	169	-10.52	2.89	0.99		SL	mm		g	ln	Irving Creek, Ontario	Halyk, 1982
leopard dace												
speckled dace	24	-4.29	3.09	0.99	23-80	FL	mm	0.10-4.1	g	log	California population	Carlander, 1969
Umatilla dace												
redside shiner												
rudd												
creek chub	103	-4.41	2.88	0.99	42-100	SL	mm		g	log	Southern Ontario	Portt, 1979
fallfish		-4.063	2.698			FL	mm		g	log	Quebec	Carlander, 1969
tench		-1.936	3.0			TL	cm		g	log	France	Fishbase
SUCKERS												
quillback		-5.238	3.134			TL	mm		g	log	DesMoines River, Iowa	Carlander, 1969
longnose sucker	350	-4.457	2.88			SL	mm		g	log	Great Slave Lake	Carlander, 1969
bridgelip sucker	286	-12.65	3.25			FL	mm		g	ln	Both sexes from the central Columbia River	Dauble, 1980

COMMON NAME	N	a	b	r	Length range	Para-meter	Units	Weight range	Units	Trans-form-ation	Comments	Reference
white sucker		-4.755	2.940		>100	TL	mm		g	log	Standard equation derived from 172 populations	Bister *et al.*, 2000
largescale sucker	76	-2.048	3.350		20-38	FL	mm		g	log	Columbia River	Carlander, 1969
mountain sucker	155	-5.7196	3.3125		96-231	TL	mm		g	log	Southwestern Montana	Hauser, 1969
lake chubsucker												
northern hog sucker		-4.697	2.902			TL	mm		g	log	Missouri	Carlander, 1969
bigmouth buffalo		-5.069	3.118		>150	TL	mm		g	log	Standard equation derived from 39 populations	Bister *et al.*, 2000
black buffalo												
spotted sucker	388	-5.753	3.341			TL	mm		g	log	Oklahoma	Carlander, 1969
silver redhorse	190	-4.263	3.124		76-559	TL	mm		g	log	Iowa	Carlander, 1969
river redhorse	52	-4.72	2.88		250-640	TL	mm		g	log	Alabama	Carlander, 1969
black redhorse	1775	-4.59	2.95		75-330	SL	mm		g	log	Big Piney River, Missouri	Carlander, 1969
golden redhorse	72	-4.85	3.07		74-272	SL	mm		g	log	Illinois	Carlander, 1969
copper redhorse	116	-5.3526	3.1803	0.99	60-681	TL	mm		g	log	Montreal area, Quebec	Mongeau *et al.*, 1992
shorthead redhorse		-4.841	2.962		>100	TL	mm		g	log	Standard equation derived from 45 populations	Bister *et al.*, 2000
greater redhorse												
BULLHEAD CATFISHES												
black bullhead		-4.974	3.085		>130	TL	mm		g	log	Standard equation derived from 87 populations	Bister *et al.*, 2000
yellow bullhead		-5.374	3.232		>60	TL	mm		g	log	Standard equation derived from 62 populations	Bister *et al.*, 2000
brown bullhead		-5.076	3.105		>130	TL	mm		g	log	Standard equation derived from 74 populations	Bister *et al.*, 2000
channel catfish		-5.800	3.294		>70	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
stonecat		-4.426	2.841			SL	mm		g	log	Ohio	Carlander, 1969
tadpole madtom		-4.533	2.91	0.97		SL	mm		g	log	Long Point, Lake Erie	Mahon, 1977
margined madtom	250	-4.748	2.89		19-145	TL	mm	0.1-35.8	g	log	Length and weight ranges are size class means.	Carlander, 1969
brindled madtom	106	-4.88	3.07	0.983		SL	mm		g	log	Mill Creek, Illinois	Burr and Mayden, 1982
northern madtom												
flathead catfish		-5.542	3.230		>130	TL	mm		g	log	Standard equation derived from 74 populations	Bister *et al.*, 2000
PIKES												
redfin pickerel												
grass pickerel	143	-5.765	3.206			TL	mm		g	log	Eagle Spring Lake, Wisconsin	Carlander, 1969
northern pike		-5.437	3.096		>100	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
muskellunge		-6.066	3.325		>380	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996

COMMON NAME	N	a	b	r	Length range	Parameter	Units	Weight range	Units	Transformation	Comments	Reference
chain pickerel		-5.824	3.243		>150	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
MUDMINNOWS												
Alaska blackfish	30	-4.984	2.971			TL	mm		g	log	Females from Eldorado Creek, Alaska	Carlander, 1969
central mudminnow												
SMELTS												
pond smelt												
surf smelt												
rainbow smelt	612	-5.276	2.952		81-290	TL	mm	3-133	g	log	Lake Superior. Length and weight ranges are means of size classes.	Carlander, 1969
pygmy smelt												
longfin smelt												
eulachon												
TROUTS												
cisco (lake herring)	684	-4.6399	2.8906		160-329	SL	mm		g	log	Saginaw Bay	Carlander, 1969
Arctic cisco	952	-2.688	3.266	0.997	4.9-46	FL	cm		g	log	Liverpool Bay (69°50'N 130°20'W), 1991	Fishbase
bloater		-4.2283	2.733			SL	mm		g	log	>200 mm in Lake Michigan	Carlander, 1969
kiyi		-5.2732	3.167			SL	mm		g	log	Northwest Lake Michigan	Carlander, 1969
Bering cisco												
blackfin cisco												
shortnose cisco	5671	-3.6071	2.468		167-312	SL	mm	51-445	g	log	Lake Michigan	Carlander, 1969
least cisco	724	-5.962	3.428			FL	mm		g	log	Ikrouvik Lake, Alaska	Carlander, 1969
shortjaw cisco	5314	0.0096	3.061		173-456	TL	cm		g	log	Lake Michigan	Fishbase
Atlantic whitefish												
lake whitefish	254	-4.7239	2.9886		350-529	SL	mm		g	log	Gull Island, Lake Michigan	Carlander, 1969
broad whitefish		-1.796	2.93	0.999			cm		g	log	Kara River, Russian Federation	Fishbase
pygmy whitefish												
round whitefish	755	-5.276	3.223		117-460	TL	mm		g	log	Lake Superior	Carlander, 1969
mountain whitefish	13,554	-5.086	3.036		>140	TL	mm		g	log	Standard equation derived from 36 populations.	Rogers *et al.*, 1996
inconnu		-4.5248	2.768			TL	mm		g	log	Grebe Lake, Montana	Carlander, 1969
golden trout		-1.770	3.0			FL	mm		g	log	California	Carlander, 1969
cutthroat trout		-5.192	3.086		>130	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
pink salmon		-2.474	3.3				cm		g	log	Sea of Okhotsk, Russian Federation	Fishbase

COMMON NAME	N	a	b	r	Length range	Para-meter	Units	Weight range	Units	Trans-form-ation	Comments	Reference
chum salmon												
coho salmon												
rainbow trout		-5.023	3.024			TL	mm		g	log	Derived from 81 lotic populations across North America	Simpkins and Hubert, 1996
sockeye salmon												
chinook salmon		-4.661	2.901		>200	TL	mm		g	log	Equation derived from many populations	Anderso and Neumann, 1996
Atlantic salmon		-5.038	3.0			FL	mm		g	log	Scotland	Carlande, 1969
brown trout	10,673	-4.867	2.960		>140	TL	mm		g	log	Standard equation derived from 51 populations.	Milewsk and Brown, 1994
Arctic char		-4.803	3.125			FL	mm		g	log	Labrador	Carlande, 1969
bull trout	142	4.8x10^{-6}	3.15	>0.99	<420	FL	mm		g		Harrison Lake, Banff National Park	Parker a d Wilhelm (no date)
brook trout		-5.085	3.043		>130	TL	mm		g	log	Equation derived from many populations	Anderso and Neumann, 1996
Aurora trout												
Dolly Varden												
lake trout		-5.681	3.2462			TL	mm		g	log	Standard equation derived from 58 populations.	Piccolo *al.*, 1993
Arctic grayling	43	-5.8791	3.325	0.996	174-427	TL	mm		g	log	Females from Fielding Lake, Alaska	Reed an McCann, 1971
TROUT-PERCHES												
trout-perch	272	-5.0321	3.08			SL	mm		g	log	Lake Erie	Carland, 1969
CODS												
burbot		-4.868	2.898		20-104.3	TL	cm		g	log	Standard equation derived from 50 populations.	Fisher *al.*, 1996
Atlantic tomcod												
KILLIFISHES												
banded killifish	423	-5.090	3.041		22-110	TL	mm		g	log	Porter's Lake, N.S.	Fritz an Garside, 1975
mummichog	325	-5.287	3.222		25-110	TL	mm		g	log	Porter's Lake, N.S.	Fritz an Garside, 1975
blackstripe topminnow												
SILVERSIDES												
brook silverside	108	-4.92	2.78	0.94		TL	mm		g	log	Lake Opinicon	Keast a d Eadie, 1984
STICKLEBACKS												
fourspine stickleback												
brook stickleback												
threespine stickleback	82	-4.670	2.795	0.89	44-72	TL	mm	0.776-3.575	g	log	Exploits River, Newfoundland.	B.A.R. nvironmental, 1996
blackspotted stickleback												
ninespine stickleback												

COMMON NAME	N	a	b	r	Length range	Para-meter	Units	Weight range	Units	Trans-form-ation	Comments	Reference
SCULPINS												
coastrange sculpin												
prickly sculpin												
mottled sculpin												
slimy sculpin	3275	-5.4947	3.3207	0.956		TL	mm		g	log	Lake Superior	Selgeby, 1988
shorthead sculpin												
torrent sculpin												
spoonhead sculpin	770	-5.284	3.1739	0.953		TL	mm		g	log	Lake Superior	Selgeby, 1988
fourhorn sculpin												
deepwater sculpin	1164	-6.009	3.5512	0.973		TL	mm		g	log	Lake Superior	Selgeby, 1988
TEMPERATE BASSES												
white perch		-5.122	3.136		>80	TL	mm		g	log	Standard equation derived from 43 populations	Bister *et al.*, 2000
white bass		-5.066	3.081		>115	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
striped bass		-4.924	3.007		>150	TL	mm		g	log	Equation derived from many populations	Brown and Murphy, 1991
SUNFISHES												
rock bass		-4.827	3.074		>80	TL	mm		g	log	Standard equation derived from 129 populations	Bister *et al.*, 2000
redbreast sunfish	3937	-4.69	3.01			TL	mm		g	log	Alabama	Carlander, 1969
green sunfish		-4.915	3.101		>60	TL	mm		g	log	Standard equation derived from 43 populations	Bister *et al.*, 2000
pumpkinseed		-5.170	3.237		>50	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
warmouth		-5.180	3.241		>80	TL	mm		g	log	Standard equation derived from 66 populations	Bister *et al.*, 2000
orangespotted sunfish	75	-5.547	3.271		44-114	TL	mm		g	log	Oklahoma	Carlander, 1969
bluegill		-5.374	3.316		>80	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
longear sunfish	164	-4.77	3.16		47-137	SL	mm		g	log	Hutchins & Clear Creeks, Illinois	Carlander, 1969
smallmouth bass	6731	-5.329	3.200		>150	TL	mm		g	log	Standard equation derived from 50 populations	Kolander *et al.*, 1993
largemouth bass		-5.316	3.191		>150	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
white crappie	27002	-5.642	3.332		>100	TL	mm		g	log	Standard equation derived from 175 populations	Neumann and Murphy, 1990
black crappie	21709	-5.618	3.345		>100	TL	mm		g	log	Standard equation derived from 80 populations	Neumann and Murphy, 1990
PERCHES												
eastern sand darter		-12.517	3.0949			TL	mm		g	ln	Western sand darters in Wisconsin	Becker, 1983
greenside darter	99	-4.02	3.19	0.99	44-67	SL	mm		g	log	Females; southern Ontario	Portt, 1979
rainbow darter	222	-3.59	3.02	0.97	25-55	SL	mm		g	log	Females; southern Ontario	Portt, 1979
Iowa darter		-12.569	3.1799			TL	mm		g	ln	Northern Wisconsin	Becker, 1983

COMMON NAME	N	a	b	r	Length range	Para-meter	Units	Weight range	Units	Trans-form-ation	Comments	Reference
fantail darter	226	-3.94	2.53	0.97	27-59	SL	mm		g	log	Southern Ontario	Portt, 1979
least darter	70	-4.42	2.81	0.97	22-30	SL	mm		g	log	Southern Ontario	Portt, 1979
johnny darter	201	-4.82	3.05	0.99	24-54	SL	mm		g	log	Southern Ontario	Portt, 1979
tessellated darter												
logperch		-11.897	3.0532			TL	mm		g	ln	Central Wisconsin	Becker, 1983
channel darter												
blackside darter		-12.254	3.1530			TL	mm		g	ln	Northern Wisconsin	Becker, 1983
river darter		-13.364	3.4414				mm		g	ln	Central Wisconsin	Becker, 1983
ruffe	230	0.0025	3.28		32-151		cm		g	log	Finland	Fishbase
yellow perch		-5.386	3.230		>100	TL	mm		g	log	Standard equation derived from 78 populations.	Willis *et al.*, 1991
sauger		-5.492	3.187		>70	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
walleye		-5.453	3.180		>150	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
DRUMS												
freshwater drum		-5.419	3.204		>100	TL	mm		g	log	Equation derived from many populations	Anderson and Neumann, 1996
GOBIES												
round goby	14	-5.0582	3.0748	0.98	29-118	TL	mm		g	log	St. Clair River	Jude *et al.*, 1992
tubenose goby	24	-5.7100	3.4821	0.99	45-87	TL	mm		g	log	St. Clair River	Jude *et al.*, 1992

Table 7. Summary of species ecological and life history features of Canadian freshwater fishes from Tables 1 to 6.

Species' ecosystem preferences: (Table 1)

	River/Stream			
Lake	Absent	Prefers	Occurs	Total
Absent	0	25	6	31
Prefers	9	122	15	146
Occurs	0	29	1	30
Total				207

Fisheries for species: (Table 1)

		Fishery			Count	%
Comm	Recr	Ab/Su	Bait	Unkn		
-	-	-	-	-	75	36.2
-	-	-	A	-	27	13.0
A	A	-	-	-	13	6.3
-	-	-	O	-	11	5.3
-	A	-	-	-	11	5.3
A	-	-	-	-	10	4.8
I	O	-	-	-	10	4.8
-	O	-	-	-	9	4.3
I	-	-	-	-	8	3.9
-	-	-	-	A	6	2.9
-	-	A	-	-	4	1.9
A	O	-	-	-	3	1.4
H	-	-	-	-	3	1.4
H/I	-	-	-	-	3	1.4
H	A	-	-	-	3	1.4
I	-	A	-	-	2	1.0
-	-	H	-	-	2	1.0
A	-	A	-	-	1	0.5
-	-	A	O	-	1	0.5
I	O	A	A	-	1	0.5
-	O	-	A	-	1	0.5
A	A	A	-	-	1	0.5
I	O	-	-	-	1	0.5
I	A	-	-	-	1	0.5

Comm-Commercial; Recr-Recreational;
Ab/Su-Aboriginal/Subsistence; Bait; Unkn-Unknown
-None; A-Active; H-Historical; I-Incidental; O-Occasional

Species with length-weight relationships: N = 131 (Table 6)

Species' temperature preferences: (Table 2)

Thermal group	Freq.	Range C	Freq.
Cold	68	1-10	8
Cold/cool	12	11-20	33
Cool	53	21-30	54
Cool/warm	27	31+	9
Warm	47	Total	104
Total	207		

Species' feeding characters: (Table 3)

Element	Category	Freq.	%	%	%
			High	Medium	Low
Location	Bottom	164	72.0	6.8	0.5
	Pelagic	117	48.3	8.2	0.0
	Surface	49	17.9	4.3	1.4
Method	Nonfeeding	4	1.9	0.0	0.0
	Filter	9	2.4	1.4	0.5
	Graz-/picking	155	72.5	1.9	0.5
	Sorting	28	13.0	0.5	0.0
	Stalking	12	5.3	0.5	0.0
	Pursuit	107	32.9	14.0	4.8
	Ambush	10	4.3	0.5	0.0
Diet	Phytoplankton	20	2.9	3.4	3.4
	Macrophytes	63	9.2	6.8	14.5
	Crustaceans	166	58.0	16.9	5.3
	Annelids	43	8.7	6.8	5.3
	Molluscs	76	14.5	11.6	10.6
	Insects	168	65.7	12.1	3.4
	Fish	96	21.7	6.8	17.9
	Parasitic	7	3.4	0.0	0.0
	Other	31	2.4	3.4	9.2

Species' life history metrics: (Tables 4,5)

	[illegible]	Freq.	[illegible]	[illegible]	[illegible]
Maximum					
	Age(y)	199	1	8	154
	Length(mm)	204	46	297	6000
	Weight(g)	80	2.446	2646.5	630000
Maturity					
	Age(y)	199	1	3	27
	Length(mm)	186	24	134	1900
	Weight(g)	20	0.7	100.5	13600

Table 8. Frequency summary of 205 Canadian freshwater fish species by spawning guild, after Balon (1975,1981).

Code	Description	Freq.
A.1.1	Nonguarders: Open substratum spawners: Pelagophils	8
A.1.2	Nonguarders: Open substratum spawners: Litho-pelagophils	13
A.1.3	Nonguarders: Open substratum spawners: Lithophils	46
A.1.4	Nonguarders: Open substratum spawners: Phyto-lithophils	20
A.1.5	Nonguarders: Open substratum spawners: Phytophils	26
A.1.6	Nonguarders: Open substratum spawners: Psammophils	8
A.2.3	Nonguarders: Brood hiders: Lithophils	37
B.1.3	Guarders: Substratum choosers: Lithophils	1
B.1.4	Guarders: Substratum choosers: Phytophils	1
B.2.2	Guarders: Nest spawners: Polyphils	1
B.2.3	Guarders: Nest spawners: Lithophils	14
B.2.4	Guarders: Nest spawners: Ariadnophils	5
B.2.5	Guarders: Nest spawners: Phytophils	4
B.2.7	Guarders: Nest spawners: Speleophils	21
	Total	205

APPENDIX A.

Nomenclature and occurrence of species considered in this report compiled by Dr. N. Mandrak. YT=Yukon Territory, NT=Northwest Territory, NU=Nunavit, BC=British Columbia, AB=Alberta, SK=Saskatchewan, MB=Manitoba, ON=Ontario, QB=Quebec, NB=New Brunswick, NS=Nova Scotia, PE=Prince Edward Island, NF=Newfoundland. *On common name denotes species not included in compilation because it is considered extinct or extirpated from Canada, is an exotic species introduced to isolated habitats such as hot springs but could not normally exist in Canada, or have been found in Canada as isolated specimens (through aquarium releases or accidental transport) that have not or would not be expected to establish reproducing populations.

Nomenclature		Occurrence												
SCIENTIFIC NAME	COMMON NAME	YT	NT	NU	BC	AB	SK	MB	ON	QB	NB	NS	PE	NF
PETROMYZONTIDAE	LAMPREYS													
Ichthyomyzon castaneus	chestnut lamprey						N	N	I					
Ichthyomyzon fossor	northern brook lamprey							N	N	N				
Ichthyomyzon unicuspis	silver lamprey							N	N	N				
Lampetra appendix	American brook lamprey								N	N				
Lampetra ayresi	river lamprey				N									
Lampetra japonica	Arctic lamprey	N	N			N								
Lampetra macrostoma	Vancouver Island lamprey				N									
Lampetra richardsoni	western brook lamprey				N									
Lampetra tridentata	Pacific lamprey				N									
Lethenteron alaskense	darktail lamprey		N											
Petromyzon marinus	sea lamprey								I	N	N	N	?	N
ACIPENSERIDAE	STURGEONS													
Acipenser brevirostrum	shortnose sturgeon										N			
Acipenser fulvescens	lake sturgeon					N	N	N	N	N				
Acipenser medirostris	green sturgeon				N									
Acipenser oxyrhynchus	Atlantic sturgeon									N	N	N	N	N
Acipenser transmontanus	white sturgeon				N									
POLYODONTIDAE	PADDLEFISHES													
Polyodon spathula	paddlefish*								N					
LEPISOSTEIDAE	GARS													
Lepisosteus osseus	longnose gar								N	N				
Lepisosteus oculatus	spotted gar								N					
Lepisosteus platyrhincus	Florida gar*								I					
AMIIDAE	BOWFINS													
Amia calva	bowfin								N/I	N				
HIODONTIDAE	MOONEYES													
Hiodon alosoides	goldeye		N		N	N	N	N	N	N				
Hiodon tergisus	mooneye					N	N	N	N	N				
ANGUILLIDAE	EELS													
Anguilla rostrata	American eel					I			N/I	N	N	N	N	N
CLUPEIDAE	HERRINGS													
Alosa aestivalis	blueback herring								?		N	N	N	
Alosa pseudoharengus	alewife								I	N	N	N		N
Alosa sapidissima	American shad				I				N/I	N	N	N		N
Dorosoma cepedianum	gizzard shad								N	N				

Nomenclature		Occurrence												
SCIENTIFIC NAME	COMMON NAME	YT	NT	NU	BC	AB	SK	MB	ON	QB	NB	NS	PE	NF
CYPRINIDAE	CARPS and MINNOWS													
Acrocheilus alutaceus	chiselmouth				N									
Campostoma anomalum	central stoneroller								N/I					
Carassius auratus	goldfish				I	I			I	I	I	I	I	
Clinostomus elongatus	redside dace								N					
Couesius plumbeus	lake chub	N	N	N	N	N	N	N	N	N	N	N		N
Ctenopharygodon idella	grass carp*					I			I					
Cyprinella spiloptera	spotfin shiner								N	N				
Cyprinus carpio	common carp				I		I	I	I	I	I			
Erimystax x-punctatus	gravel chub								N					
Exoglossum maxillingua	cutlips minnow								N	N				
Hybognathus argyritis	western silvery minnow					N								
Hybognathus hankinsoni	brassy minnow				N	N	N	N	N	N				
Hybognathus regius	eastern silvery minnow								N	N				
Luxilus chrysocephalus	striped shiner								N					
Luxilus cornutus	common shiner						N	N	N	N	N	N		
Lythrurus umbratilis	redfin shiner								N					
Macrhybopsis storeriana	silver chub							N	N					
Margariscus margarita	pearl dace				N	N	N	N	N	N	N	N		N
Mylocheilus caurinus	peamouth		N		N									
Nocomis biguttatus	hornyhead chub							N/I	N/I					
Nocomis micropogon	river chub								N/I					
Notemigonus crysoleucas	golden shiner						N	N	N	N	N	N		
Notropis anogenus	pugnose shiner								N					
Notropis atherinoides	emerald shiner		N		N	N	N	N	N	N				
Notropis bifrenatus	bridle shiner								N	N				
Notropis blennius	river shiner					N	N	N						
Notropis buchanani	ghost shiner								I					
Notropis dorsalis	bigmouth shiner							N						
Notropis heterodon	blackchin shiner							N	N	N				
Notropis heterolepis	blacknose shiner						N	N	N	N	N	N		
Notropis hudsonius	spottail shiner		N		N	N	N	N	N	N				
Notropis photogenis	silver shiner								N					
Notropis rubellus	rosyface shiner							N	N	N				
Notropis stramineus	sand shiner						N	N	N	N				
Notropis texanus	weed shiner							I						
Notropis volucellus	mimic shiner							N	N	N				
Opsopoeodus emiliae	pugnose minnow								N					
Phoxinus eos	northern redbelly dace		N		N	N	N	N	N	N	N	N	N	
Phoxinus neogaeus	finescale dace		N		N	N	N	N	N	N	N			
Pimephales notatus	bluntnose minnow							N	N	N				
Pimephales promelas	fathead minnow		N		I	N	N	N	N	N	N			
Platygobio gracilis	flathead chub	N	N		N	N	N	N						
Ptychocheilus oregonensis	northern squawfish				N	N								
Rhinichthys atratulus	blacknose dace							N	N	N	N	N		
Rhinichthys cataractae	longnose dace	N	N		N	N	N	N	N	N				N
Rhinichthys cataractae smithi	Banff longnose dace*					N								
Rhinichthys falcatus	leopard dace				N									

Nomenclature		Occurrence												
SCIENTIFIC NAME	**COMMON NAME**	**YT**	**NT**	**NU**	**BC**	**AB**	**SK**	**MB**	**ON**	**QB**	**NB**	**NS**	**PE**	**NF**
Rhinichthys osculus	speckled dace				N									
Rhinichthys umatilla	Umatilla dace				N									
Richardsonius balteatus	redside shiner				N	N								
Scardinius erythrophthalmus	rudd								I					
Semotilus atromaculatus	creek chub							N	N	N	N	N		
Semotilus corporalis	fallfish								N	N	N			
Tinca tinca	tench				I									
CATOSTOMIDAE	SUCKERS													
Carpiodes cyprinus	quillback					N	N	N	N	N				
Catostomus catostomus	longnose sucker	N	N	N	N	N	N	N	N	N	N			N
Catostomus columbianus	bridgelip sucker				N									
Catostomus commersoni	white sucker	N	N		N	N	N	N	N	N	N	N		N
Catostomus macrocheilus	largescale sucker				N	N								
Catostomus platyrhynchus	mountain sucker				N	N	N							
Erimyzon sucetta	lake chubsucker								N					
Hypentelium nigricans	northern hog sucker								N					
Ictiobus cyprinellus	bigmouth buffalo						I	I	I					
Ictiobus niger	black buffalo								I					
Minytrema melanops	spotted sucker								N					
Moxostoma anisurum	silver redhorse					N	N	N	N	N				
Moxostoma carinatum	river redhorse								N	N				
Moxostoma duquesnei	black redhorse								N					
Moxostoma erythrurum	golden redhorse							I	N					
Moxostoma hubbsi	copper redhorse									N/E				
Moxostoma macrolepidotum	shorthead redhorse					N	N	N	N	N				
Moxostoma valenciennesi	greater redhorse								N	N				
CHARACIDAE	CHARACINS													
Colossoma bidens	pacu*								I					
ICTALURIDAE	BULLHEAD CATFISHES													
Ameiurus melas	black bullhead				I		N	N	N					
Ameiurus natalis	yellow bullhead								N	N				
Ameiurus nebulosus	brown bullhead				I		N	N	N	N	N	N		
Ictalurus punctatus	channel catfish						I	N	N	N				
Noturus flavus	stonecat					N		N	N	N				
Noturus gyrinus	tadpole madtom						N	N	N	N				
Noturus insignis	margined madtom								[illegible]	I				
Noturus miurus	brindled madtom								N					
Noturus stigmosus	northern madtom								[illegible]					
Pylodictus olivaris	flathead catfish													
LORICARIIDAE	SUCKERMOUTH CATFISHES													
Panaque nigrolineatus	royal panaque*													
ESOCIDAE	PIKES													
Esox americanus americanus	redfin pickerel									N				
Esox a. vermiculatus	grass pickerel								N	N				
Esox lucius	northern pike	N	N	N	N	N	N	N	N	N				N
Esox masquinongy	muskellunge								N/I	N				

Nomenclature		Occurrence												
SCIENTIFIC NAME	COMMON NAME	YT	NT	NU	BC	AB	SK	MB	ON	QB	NB	NS	PE	NF
Esox niger	chain pickerel									N	I	I		
UMBRIDAE	MUDMINNOWS													
Dallia pectoralis	Alaska blackfish								I					
Umbra limi	central mudminnow							N	N	N				
OSMERIDAE	SMELTS													
Hypomesus olidus	pond smelt	N	N											
Hypomesus pretiosus	surf smelt				N									
Osmerus mordax	rainbow smelt	N	N	N	N				N/I	N	N	N	N	N
Osmerus spectrum	pygmy smelt									N	N			
Spirinchus thaleichthys	longfin smelt				N	N								
Thaleichthys pacificus	eulachon				N	N								
SALMONIDAE	TROUTS													
Coregonus artedi	cisco (lake herring)		N	N	N	N	N	N	N/I	N				
Coregonus autumnalis	Arctic cisco	N	N	N	N									
Coregonus hoyi	bloater								N/E					
Coregonus johannae	deepwater cisco*								N/E					
Coregonus kiyi	kiyi								N/E					
Coregonus laurettae	Bering cisco	N												
Coregonus nigripinnis	blackfin cisco								N/E					
Coregonus reighardi	shortnose cisco								N/E					
Coregonus sardinella	least cisco	N	N	N	N									
Coregonus zenithicus	shortjaw cisco		N			N	N	N	N					
Coregonus huntsmani	Atlantic whitefish											N		
Coregonus clupeaformis	lake whitefish	N	N	N	N/I	N	N	N	N	N	N	N		N
Coregonus nasus	broad whitefish	N	N	N	N									
Prosopium coulteri	pygmy whitefish	N			N	N			N					
Prosopium cylindraceum	round whitefish	N	N	N	N	N	N	N	N	N	N			N
Prosopium williamsoni	mountain whitefish				N	N								
Stenodus leucichthys	inconnu	N	N		N									
Hucho hucho	Danube salmon*									I				
Oncorhynchus aguabonita	golden trout				I	I								
Oncorhynchus clarki	cutthroat trout				N/I	N				I				
Oncorhynchus gorbuscha	pink salmon	N	N		N				I	I				
Oncorhynchus keta	chum salmon	N	N		N				I					
Oncorhynchus kisutch	coho salmon	N			N	I	I		I	I				
Oncorhynchus masou	cherry salmon*								I					
Oncorhynchus mykiss	rainbow trout	N/I			N	N/I	I	I	I	I	I	I	I	I
Oncorhynchus nerka	sockeye salmon	N			N/I	I			I	I				
Oncorhynchus tshawytscha	chinook salmon	N			N				I	I				
Salmo salar	Atlantic salmon				I	I			N/I	N	N	N	N	N
Salmo trutta	brown trout				I	I	I	I	I	I	I	I		I
Salvelinus alpinus	Arctic char	N	N	N		I		N	N/I	N	N			N
Salvelinus confluentus	bull trout				N	N								
Salvelinus fontinalis	brook trout				I	I	I	N	N	N	N	N	N	N
Salvelinus fontinalis timagamiensis	Aurora trout								N/E					
Salvelinus malma	Dolly Varden	N	N		N	I								
Salvelinus namaycush	lake trout	N	N	N	N/I	N	N	N	N/I	N	N	N		N

Nomenclature		Occurrence												
SCIENTIFIC NAME	COMMON NAME	YT	NT	NU	BC	AB	SK	MB	ON	QB	NB	NS	PE	NF
Thymallus arcticus	Arctic grayling	N	N	N	N/I	N	N	N	I	I				
PERCOPSIDAE	TROUT-PERCHES													
Percopsis omiscomaycus	trout-perch	N	N	N	N	N	N	N	N	N				
GADIDAE	CODS													
Lota lota	burbot	N	N	N	N	N	N	N	N	N	N			N
Microgadus tomcod	Atlantic tomcod									N	N	N	N	N
CYPRINODONTIDAE	KILLIFISHES													
Fundulus diaphanus	banded killifish							N	N	N	N	N	N	N
Fundulus heteroclitus	mummichog									N	N	N	N	N
Fundulus notatus	blackstripe topminnow								N					
POECILIDAE	LIVEBEARERS													
Gambusia affinis	western mosquitofish*					I			I					
Poecilia latipinna	sailfin molly*					I								
Poecilia reticulata	guppy*					I								
Xiphophorus helleri	green swordtail*					I								
ATHERINIDAE	SILVERSIDES													
Labidesthes sicculus	brook silverside								N	N				
GASTEROSTEIDAE	STICKLEBACKS													
Apeltes quadracus	fourspine stickleback								I	N	N	N	N	N
Culaea inconstans	brook stickleback		N		N	N	N	N	N	N	N	N		
Gasterosteus aculeatus	threespine stickleback		N	N	N	I		N	N/I	N	N	N	N	N
Gasterosteus wheatlandi	blackspotted stickleback									N	N	N	?	N
Pungitius pungitius	ninespine stickleback		N	N	N	N	N	N	N	N	N	N	N	N
COTTIDAE	SCULPINS													
Cottus aleuticus	coastrange sculpin				N									
Cottus asper	prickly sculpin				N	N?								
Cottus bairdi	mottled sculpin				N	N?		N	N	N				N
Cottus cognatus	slimy sculpin	N	N	N	N	N	N	N	N	N	N			N
Cottus confusus	shorthead sculpin				N	N								
Cottus rhotheus	torrent sculpin				N									
Cottus ricei	spoonhead sculpin	N	N	N	N	N	N	N	N	N				
Myoxocephalus quadricornis	fourhorn sculpin	N	N	N				N	N	N				N
Myoxocephalus thompsoni	deepwater sculpin		N			N	N	N	N	N				
CYCLOPTERIDAE	LUMPFISHES													
Cyclopterus lumpus	lumpfish*								I					
PERCICHTHYIDAE	TEMPERATE BASSES													
Morone americana	white perch								I	N	N	N	N	
Morone chrysops	white bass							I	N	N				
Morone saxatilis	striped bass									N	N	N	N	
CENTRARCHIDAE	SUNFISHES													
Ambloplites rupestris	rock bass						N	N	N	N				
Lepomis auritus	redbreast sunfish										N			
Lepomis cyanellus	green sunfish								N					
Lepomis gibbosus	pumpkinseed				I	I		N	N	N/I	N			
Lepomis gulosus	warmouth								I					
Lepomis humilis	orangespotted sunfish								I					
Lepomis macrochirus	bluegill								N	N				
Lepomis megalotis	longear sunfish								N	N				

Nomenclature		Occurrence												
SCIENTIFIC NAME	COMMON NAME	YT	NT	NU	BC	AB	SK	MB	ON	QB	NB	NS	PE	NF
Micropterus dolomieu	smallmouth bass				I	I	I	N/I	N/I	N/I	N/I	N/I		
Micropterus salmoides	largemouth bass				I	I	I	I	N/I	N				
Pomoxis annularis	white crappie								N					
Pomoxis nigromaculatus	black crappie				I			N	N	N				
PERCIDAE	PERCHES													
Ammocrypta pellucida	eastern sand darter								N	N				
Etheostoma blennioides	greenside darter								N					
Etheostoma caeruleum	rainbow darter								N	I				
Etheostoma exile	Iowa darter					N	N	N	N	N				
Etheostoma flabellare	fantail darter								N	N				
Etheostoma microperca	least darter								N					
Etheostoma nigrum	johnny darter						N	N	N	N				
Etheostoma olmstedi	tessellated darter								N	N				
Percina caprodes	logperch					N	N	N	N	N				
Percina copelandi	channel darter								N	N				
Percina maculata	blackside darter						N	N	N					
Percina shumardi	river darter							N	N					
Gymnocephalus cernuus	ruffe								I					
Perca flavescens	yellow perch		N		N/I	N	N	N	N	N	N	N		
Stizostedion canadense	sauger					N	N	N	N	N				
Stizostedion vitreum glaucum	blue pike*								N/E					
Stizostedion vitreum vitreum	walleye		N		I/N	N	N	N	N	N				
SCIAENIDAE	DRUMS													
Aplodinotus grunniens	freshwater drum						N	N	N	N				
CICHLIDAE	CICHLIDS													
Astronotus ocellatus	oscar*								I					
Cichlosoma managuense	jaguar guapote*								I					
Cichlosoma nigrofasciatum	convict cichlid*					I								
Hemichromis bimaculatus	African jewelfish*					I								
Pterophyllum scalare	freshwater angelfish*					I								
GOBIIDAE	GOBIES													
Neogobius melanostomus	round goby								I					
Proterorhinus marmoratus	tubenose goby								I					
PLEURONECTIDAE	RIGHTEYE FLOUNDERS													
Platichthys flesus	European flounder*								I					

APPENDIX B.

Definitions for the reproductive guilds attributed to Canadian freshwater fishes, as listed in Table 5. For detailed descriptions of these guilds and others, please see Balon (1975, 1981).

Guild code	Guild name	Description
A.1.1	Nonguarders: Open substratum spawners: Pelagophils	Large quantities of non-adhesive, near-neutral or positively buoyant eggs are released and scattered in open water. No parental care of eggs.
A.1.2	Nonguarders: Open substratum spawners: Litho-pelagophils	Eggs are deposited on rocks and gravel, but the eggs, eleutheroembryos, or larvae become sufficiently buoyant to be carried away from the spawning substrate by water currents. No parental care of eggs.
A.1.3	Nonguarders: Open substratum spawners: Lithophils	Deposit eggs on a rock, rubble, or gravel bottom where their embryos and larvae develop. No parental care of eggs.
A.1.4	Nonguarders: Open substratum spawners: Phyto-lithophils	Deposit eggs in relatively clearwater habitats on submerged plants, if available, or on other submerged items such as rocks, logs, or gravel, where their embryos and larvae develop. No parental care of eggs.
A.1.5	Nonguarders: Open substratum spawners: Phytophils	Scatter or deposit eggs with an adhesive membrane that sticks to submerged, alive or dead, aquatic plants, or to recently flooded terrestrial vegetation. Sometimes on logs and branches. No parental care of eggs.
A.1.6	Nonguarders: Open substratum spawners: Psammophils	Usually small eggs with an adhesive membrane that are scattered directly on sand and/or the fine roots of plants that hang over the sandy bottom. No parental care of eggs.
A.2.3	Nonguarders: Brood hiders: Lithophils	Eggs are hidden in specially constructed places. In most cases the hiding places (called redds in salmonids) are excavated in gravel by the female. No parental care of eggs.
B.1.3	Guarders: Substratum choosers: Lithophils	Choose rocks for attachment of their eggs. Eggs are guarded, and possibly cleaned and ventilated.
B.1.4	Guarders: Substratum choosers: Phytophils	Choose plants for attachment of their eggs. Eggs are guarded, and possibly cleaned and ventilated.
B.2.2	Guarders: Nest spawners: Polyphils	No particular nest building material or substrate is chosen, however, a nest is constructed and the nest and eggs are guarded.
B.2.3	Guarders: Nest spawners: Lithophils	Eggs are deposited on cleaned areas of rocks or in pits dug in gravel, however, numerous deviations from this simple scheme have been recorded. All nests are guarded.
B.2.4	Guarders: Nest spawners: Ariadnophils	The nest building male has the ability to spin a viscid thread from a kidney secretion, which binds the nest of different material together. The eggs are guarded and ventilated by the male, who also guards the young once they hatch.
B.2.5	Guarders: Nest spawners: Phytophils	Eggs are deposited in nests constructed above or on a soft muddy bottom, often amid algae or the exposed roots of vascular plants, however, there are numerous deviations from this scheme. All nests are guarded.
B.2.7	Guarders: Nest spawners: Speleophils	These fishes guard a clutch of eggs in natural holes or cavities, in specially constructed burrows, or where deposited on a cleaned area of the undersurface of flat stones.